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AND  
FACT-INDEX

INTERESTING · ACCURATE · UP-TO-DATE



*To inspire ambition, to stimulate the  
imagination, to provide the inquiring  
mind with accurate information told in  
an interesting style, and thus lead into  
broader fields of knowledge—such is  
the purpose of this work*

VOLUME 9

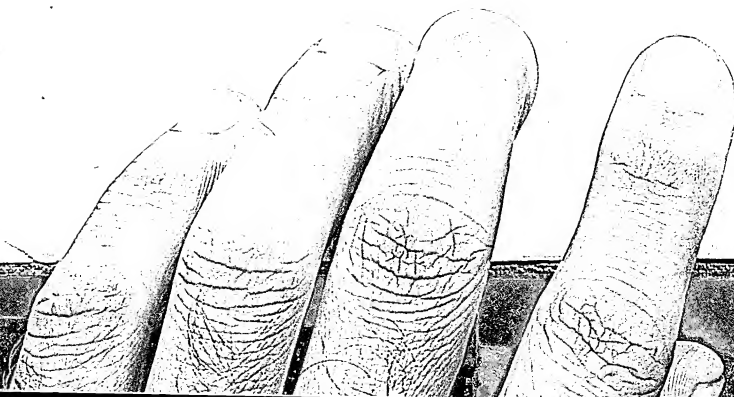
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# Here and There in This Volume

AT ODD TIMES when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. With this as a guide, you may visit far-away countries and watch people at their work and play, meet famous persons of ancient and modern times, review history's most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list is not intended to serve as a table of contents, an index, or a study-guide. For these purposes consult the Fact-Index and the Reference-Outlines.

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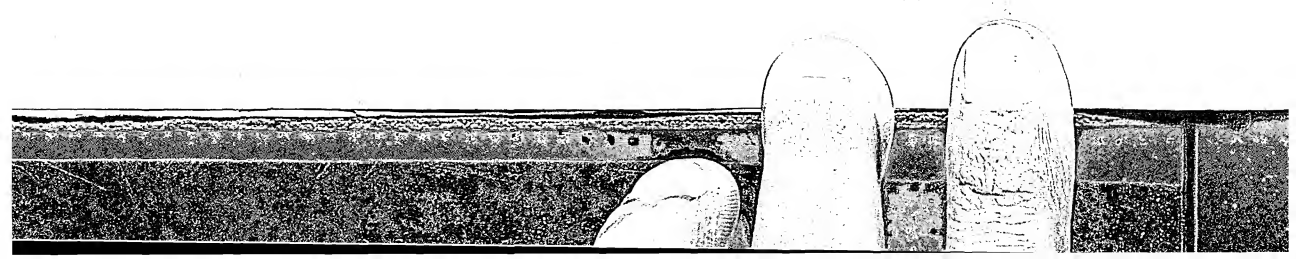
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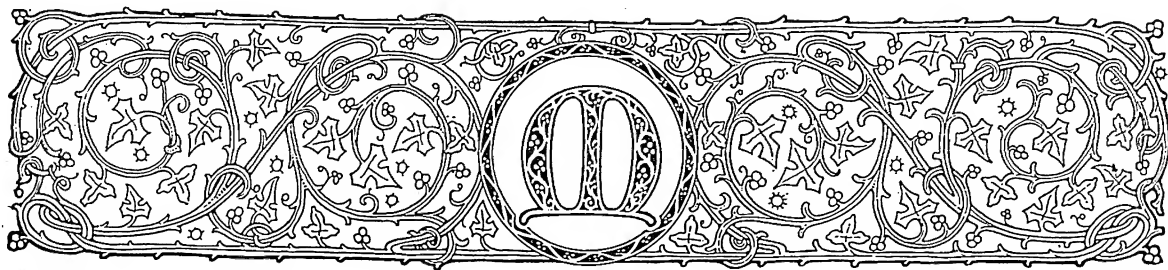
# HERE AND THERE IN THIS VOLUME

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### *Key to Pronunciation*

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index. Marked letters are sounded as in the following words: *cāpe, āt, fār, fāst, whāt, fall; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rūde, full, būrn; ū* = French *u*, German *ü*; *gem, gō; thin, then; ñ* = French nasal (*Jean*); *zh* = French *j* (*z* in *azure*); *κ* = German guttural *ch*.



**M**ACARONI. Cooked with cheese or served with tomato sauce, this national dish of Italy deserves the widespread popularity it has acquired as a nutritious and palatable food. For macaroni is made from certain varieties of wheat which are very rich in gluten and other nitrogenous compounds. The *durum* wheat, from which most of it is made, is grown chiefly in southern Europe and in the United States.

The coarsely ground flour, mixed with hot water, is kneaded to a stiff paste, which is molded into sticks (spaghetti) or pipes (macaroni); into fine threads (vermicelli); and into small stars, disks, alphabet letters, etc., for use in soups. The dough is put into a cylindrical vessel having a perforated bottom, and a heavy iron plate, driven by a powerful press, forces the paste through in the desired shapes. The long strings of paste are then looped up over rods to dry. For the letters and other "pastes" a shearing arrangement slices off the dough in thin little pieces as it is forced through the molds.

The next time you open a package of macaroni or spaghetti see if the flattened mark of the rod is at the curve. If so, it is the true macaroni, made from flour rich in gluten; for that made from other flours will not bear its own weight, and must be laid out flat to be dried. True macaroni is hard and elastic, yellowish in color and rough in texture. In boiling it swells until it is double its original size without becoming pasty and sticky.

**MacARTHUR, DOUGLAS** (born 1880). In the dark days of 1941-42, following the Japanese attack on Pearl Harbor, the name of Gen. Douglas MacArthur became to the world a symbol of American courage, determination, and fighting ability.

Under his command the 12,000 American and 35,000 Filipino troops besieged on Bataan peninsula west of Manila beat back week after week many times their number of Japanese soldiers. Though they lacked air support and were cut off from supplies and reinforcements, MacArthur's men were not content with defensive action alone. Again and again they carried out bold and brilliant attacks, and so demoralized the Japanese armies that their first commanding general was believed to have killed himself.

While the enemy was capturing Hong Kong, sweeping down the Malay Peninsula, taking Singapore, and overwhelming the Dutch East Indies, MacArthur stood firm. So conspicuous was his achievement that when an invasion of Australia was threatened, the Australian press joined in a widespread demand that the hero of Bataan be ordered out of the Philippine trap to take command of all the forces of the United Nations in the southwest Pacific.

Accordingly, President Roosevelt on Feb. 22, 1942, sent secret orders to MacArthur to break out through



**DOUGLAS MacARTHUR**

the Japanese lines as soon as possible and report for duty in Australia. On the night of March 11, after completing the transfer of his Philippine command to Gen. Jonathan M. Wainwright, MacArthur and his wife and four-year-old son and members of his staff ran the Japanese blockade in torpedo boats and made their perilous way southward through the islands. At a secret landing place, they met rescue planes in which they reached Australia six days later. The announcement of his arrival was heralded on the front pages of newspapers the world around.

MacArthur seemed destined from birth for a brilliant military career.

He was born Jan. 26, 1880, on an army reservation at Little Rock, Ark. His father was Gen. Arthur MacArthur, who served with distinction in the Civil War and the Spanish-American War and was military governor of the Philippines under President McKinley. At West Point young MacArthur was graduated in 1903 with the highest scholastic record achieved by any cadet in 25 years. When the United States entered the first World War, he helped to organize the Rainbow Division and went to France as its chief of staff. In battle he was usually up on the firing line and he was twice wounded in action. The end of the war found him at the head of the Rainbow Division, the youngest divisional commander in the Army. The following year, at the age of 39, he was made commandant at West Point, again the youngest on record. At 50, President Hoover made him chief of staff of the Army, and he became the youngest full general in American history.

For the next five years he fought with little success to get the Army mechanized. His next assignment



was to organize the defense of the Philippines in preparation for their promised independence. In 1937 he retired from the service, but continued his work in the Philippines under President Manuel Quezon, who gave him the rank of field marshal. In July 1941 he was recalled to active service as commander of the United States forces in the Far East, and performed miracles of preparation and training during the short time that elapsed before the Japanese attack.

When MacArthur was awarded the Congressional Medal of Honor for his work at Bataan, he said the tribute belonged rather to the gallant army which it had been his high honor to command.

MACAULAY, THOMAS BABINGTON (1800-1859). In Trevelyan's 'Life and Letters of Lord Macaulay' is found the following letter to his little niece Margaret:

Sept. 15th, 1842

MY DEAR BABA:

Thank you very much for your very pretty letter. I am always glad to make my little girl happy and nothing pleases me so much as to see that she likes books. For when she is as old as I am, she will find that they are better than all the tarts, and cakes, and toys, and plays, and sights in the world. If anybody would make me the greatest king that ever lived, with palaces, and gardens, and fine dinners, and wine, and coaches, and beautiful clothes, and hundreds of servants, on condition that I would not read books, I would not be a king. I would rather be a poor man in a garret with plenty of books, than a king who did not love reading.

Macaulay's letter spoke the absolute truth about himself. From the time he began to read at the age of three, books were his constant companions. He learned to read Greek, Latin, French, German, Spanish, Italian, and Dutch. He was a brilliant student at Cambridge University in every subject except mathematics. He read early and late, in bed and out of doors. Indeed Trevelyan says that "the only exercise in which he can be said to have excelled was that of threading crowded streets with his eyes fixed upon a book." No wonder that his friend Sydney Smith once remarked that he was "like a book in breeches."

Macaulay's wide knowledge and his marvelous memory made him a very interesting speaker, for he never ran out of material and he was always sure of his facts. Lord Melbourne, one of his colleagues in Parliament, said of him, "I wish I were as cocksure of anything as Macaulay is of everything." The remark contains a sting, for Macaulay was never bothered by doubts of his own ability.

Macaulay's father, Zachary Macaulay, was a well-known reformer whose lifelong opposition to African slavery wrecked the family fortunes. His son studied law and was admitted to the bar but soon turned aside to follow the career of literature. In August 1825 appeared his essay on Milton, the first of a

series which for 20 years made him and the *Edinburgh Review* famous. The world of fashion and of letters now learned that this young man could write as brilliantly as he talked.

Macaulay's gifts as a writer and speaker led him naturally into public life. In Parliament, and later in India as legal adviser to the supreme council, he showed gifts of mind that always held men's attention. In politics he was a Whig, striving for a wider voting franchise and far-reaching liberal reforms. He was pleased, however, with material progress of the time and closed his eyes to what he considered necessary economic evils.

But during all the busy years of his official life, when writing was just an occasional pleasure and source of income, Macaulay was planning a history of England to begin with the accession of James II to the throne—a history, as he said, interesting enough "to supersede the last fashionable novel upon the dressing-tables of young ladies." He began it in earnest in 1841 and in 1849 finished the first two volumes. Later volumes appeared from time to time, but the work was still uncompleted when Macaulay died, just ten years later.

#### History as Fascinating as Fiction

Macaulay's history had an immediate success, greater, perhaps, than that achieved by any other history. It had a tremendous sale in England and the United States, and was translated into all modern languages. Macaulay had worked at it with un-

grudging toil. He wrote in his diary at one time: "This is a tough chapter. . . . What trouble these few pages cost me! The great object is that they may read as if they had been spoken off and seem to flow as easily as table talk." His paragraphs accomplish just what he intended. They sweep the reader along.

For a generation Macaulay was read with respect as well as enthusiasm. In the generation that followed, his fame was not quite so great. His brilliance, his power of painting a picture, of narrating an incident still are unsurpassed; but his insight into the complex character of men and of movements left some-

thing to be desired. He saw men's outward actions, but he could not divine their inner character or their motives.

Equally popular with Macaulay's essays and his history was a little volume of poems entitled 'Lays of Ancient Rome'. These still delight old and young, not merely as an exercise in the reconstruction of historic materials but because of their stirring melody.

In 1857 Macaulay was made a peer with the title Baron Macaulay. He lived to enjoy this new honor only two years. When he died, at the end of 1859, the greatest honor that England can show to her



MACAULAY

illustrious dead was conferred upon him, for he was buried in Westminster Abbey.

His principal books are: 'Critical and Historical Essays' (4 vols.); 'History of England' (5 vols.). 'The Life and Letters of Lord Macaulay' by his nephew George Otto Trevelyan is an excellent biography.

**MACAW.** A variety of South American parrots distinguished by their brilliant plumage, long wedge-shaped tail, long and pointed wings, naked cheeks, and short, highly arched bill. They are easily domesticated, but do not readily learn to talk and persist in violent screaming. There are a large number of species, of which the red and blue macaw (*Ara macao*) and the blue and yellow macaw (*Ara ararauna*) are among the handsomest. (See Parrots, Macaws, and Cockatoos.)

**MACBETH.** This hero of Shakespeare's powerful tragedy of that name is in command of the armies of Scotland, when the play opens, and has just won a great victory over the Danes. The triumph so fires his ambition that witches, bent on evil, easily implant in his mind the thought that he should be king. Lady Macbeth still further incites him, until with his own hands he murders the Scottish king and usurps the throne. From that moment great Macbeth goes swiftly to his doom. Ghosts rise to haunt him, Lady Macbeth dies insane, civil war breaks out led by Malcolm, the son and heir of the murdered king, and finally he himself is slain in battle. Macbeth is to be abhorred for his crimes, but in all that he does and says he excites a tragic pity, as when, informed of the death of the queen, he thus gives utterance to his gloomy thoughts:

Tomorrow, and tomorrow, and tomorrow,  
Creeps in this petty pace from day to day,  
To the last syllable of recorded time;  
And all our yesterdays have lighted fools  
The way to dusty death. Out, out, brief candle!  
Life's but a walking shadow, a poor player  
That struts and frets his hour upon the stage  
And then is heard no more: it is a tale  
Told by an idiot, full of sound and fury,  
Signifying nothing.

The story of the play is taken from history, the real Macbeth having ruled over Scotland from the year 1040 to 1057.

**McCLELLAN, GEORGE BRINTON** (1826-1885). General Robert E. Lee of the Confederate army once said that General McClellan was the best general ever arrayed in arms against him; and yet, after less than six months' command of a large force in the field, McClellan was removed as a failure.

He had good training. In 1846 he had graduated from West Point, and in the Mexican War he had proved so good a soldier that he had been appointed captain. In 1855 the United States government had sent him to Europe to study the war in the Crimea. At the beginning of the Civil War, in May 1861, President Lincoln had appointed him major general in the United States Army. Immediately he had been sent into West Virginia, where he had rendered valuable assistance to the loyal Unionists, who were seceding

from their mother state. On account of this signal success he was hailed as "the Little Napoleon," and was called to Washington to reorganize the Army of the Potomac after its disastrous defeat at Bull Run.

His aptitude for this work was soon apparent. In a short time order and system appeared where chaos and confusion had reigned. He was a wonderful organizer and a hard worker. He won the devotion of his army, and became the idol of the hour. In November 1861 President Lincoln appointed him commander of the United States Army.

But now the fault appeared which was to overshadow all his excellent qualities. McClellan was a good organizer but a poor fighter. He had built up a wonderful military machine, but he hesitated to use it. Summer and winter passed, and still he made no move against the enemy. The patience of the administration and of the people was sorely tried. Finally, in April 1862, under direct orders from President Lincoln, he entered upon his disastrous Peninsular Campaign, between the York and James rivers of Virginia. He advanced within a few miles of Richmond, but after a terrible week of fighting, known as the "Seven Days' battles" (June 25 to July 1), he was driven back and was directed to abandon the peninsula. Union losses in the week's battles were 15,849; Confederate, 19,749. A large part of his army was ordered to reinforce General Pope's troops, and the order was reluctantly obeyed. Pope's disastrous defeat in the second battle of Bull Run gave McClellan a new chance to retrieve his fame. Again in supreme command of the Army of the Potomac, he met Lee at Antietam, Md., where occurred one of the bloodiest battles of the war (Sept. 16-17, 1862). Lee was forced to withdraw from Maryland, but McClellan showed his old fault. Instead of driving forward at once, he allowed Lee to recross the Potomac unmolested. When he did follow, his movements were so slow that in November he was relieved of his command, and Gen. A. E. Burnside was appointed in his place.

This action of Lincoln's caused much bitter criticism, for McClellan still had many devoted admirers. In the election of 1864 all who were dissatisfied with Lincoln's conduct of the war supported McClellan for president. But he carried only three states—New Jersey, Kentucky, and Delaware. McClellan had resigned his commission in the Army before the election took place. The rest of his life was spent in following his profession of engineering, except for a brief term (1878-81), when he was governor of the state of New Jersey.

**McCORMICK, CYRUS HALL** (1809-1884). On a day in July 1831 a crowd gathered near the town of Steele's Tavern, Va. A strange-looking machine had just been pulled out on the field. It was the newly invented reaper of Cyrus Hall McCormick, a young man of 22. Doubtfully the crowd awaited the demonstration. The farm hands were among the most skeptical. Then to their amazement the machine clanked down



the field cutting the grain far faster than they could do it with their cradle scythes. Although they little realized it, they were witnessing a momentous event: machinery was replacing manual labor on the farm.

For years men had been experimenting with mechanical reapers to lessen the labor of hand reaping and to speed the work. Some inventions had already been patented in England and America. Even at this moment, Obed Hussey was at work in Cincinnati on a model, which he patented in 1833. Six months after that, in 1834, McCormick patented his own reaper, which he had been improving to get rid of the faults revealed by the first demonstration.

Cyrus, the son of Robert and Mary Ann (Hall) McCormick, was born at "Walnut Grove," the farm of his Scotch-Irish parents, in Rockbridge County, Va. His father was a prosperous landowner, keenly interested in the mechanical side of farm life; he had invented a hemp break and had experimented with a reaper. Cyrus was also mechanically inclined and, like his father, was something of a dreamer; but from his mother he had derived a lively sense of the practical. Father and son worked constantly together, and built many strange contrivances that did not always work.

After May 1831, when his father abandoned his unsuccessful efforts to build a reaper, Cyrus had started to build a machine of his own. The machine that he tried out in July of the same year combined in an effective unit the elements which are still the basis of the modern reaper. After patenting it, he continued to work on its further improvement. In 1840 he sold his first two machines in Virginia. In 1843 his business branched out beyond the state. In 1847 he had the vision to move to Chicago and build a manufacturing plant of his own in the new grain-growing section of the Middle West.

McCormick soon proved that his talents as an inventor were equaled by his genius in business. He began manufacturing on a large scale, advertising, demonstrating, and guaranteeing his product, offering replaceable parts, and selling on the instalment plan. In spite of lawsuits and competition, he was for years the dominant figure in the industry. When the Civil War broke out, the 50,000 reapers in use released thousands of men for duty at the front. His machine won recognition abroad—in England in 1851, then in France—and ultimately throughout the world.

By 1875 the McCormick factories were yearly turning out thousands of reapers and mowers. Before the end of the century, they had introduced scores of other implements to speed up farm work and lessen its drudgery (*see Agriculture; Reaping Machines*).

**MacDONALD, JAMES RAMSAY** (1866-1937). The son of a poor workman of Lossiemouth, Scotland, Ramsay MacDonald became Great Britain's first Labor prime

minister. As a boy he was so studious that he was paid to help the teacher in the village school. At 18 he went to London and soon took active part in the work of the Independent Labor party. His marriage in 1896 to Margaret Ethel Gladstone, niece of Lord Kelvin, not only gave him a sympathetic and loyal companion but also brought financial independence.

By 1906, when first elected to Parliament, MacDonald had helped to form a new Labor party, organized for independent political action. He grew in power until 1914, when his opposition to the declaration of war on Germany almost wrecked his career. But in 1922 the Labor party again chose him as its leader and in January 1924, with the help of the Liberals, he became prime minister. When he sought to promote world peace through treaties with Soviet Russia, the Liberals withdrew their support and he was forced to resign the same year.

In 1929 the Labor party again won and MacDonald again headed the government. Two years later the financial crisis defeated his party, but he was

asked to head a National, or coalition, government of Liberals, Conservatives, and Laborites. The compromises he was forced to make during this critical period brought upon him the charge of being a traitor to labor. In 1935 he resigned as premier and took the inactive position of lord president of the council. (*See also England.*)

**MACDONALD, SIR JOHN ALEXANDER** (1815-1891). For nearly half a century the history of Canada is the history of Sir John A. Macdonald—"John A.," as he was affectionately termed. Under his leadership four of the most significant events of that half-century were accomplished—the federation of the separate provinces into the Dominion, stretching from ocean to ocean and occupying half the area of North America; the acquisition of the vast Canadian Northwest from the Hudson's Bay Company; the building of the Intercolonial and Canadian Pacific railways to unite this far-flung domain; and the adoption of a protective tariff policy, which started the Dominion of Canada on its course of industrial prosperity.

Macdonald was premier of the Dominion from 1867 to 1873, and from 1878 to 1891. Other men originated policies; he put them into effect. Other men excelled him in powers of oratory, breadth of vision, and knowledge, but none had a more intense patriotism, and none equaled him in genius for leadership.

He came to Canada at the age of five, a poor Scottish immigrant boy. Poverty ended his schooling at the age of 15, but his insatiable curiosity and love of reading soon made up, in a large degree, for the lack of formal education. Entering a law office he was admitted to the bar at 21, and eight years later was elected to the Canadian Assembly. Almost at once he became one of the leaders of the Conservative



CYRUS McCORMICK

party, winning a cabinet position within three years.

By 1864 the union of Upper Canada (Quebec), formed in 1841, was fast drifting into chaos because of party warfare and racial and religious jealousies. Macdonald's political tact made him the leader in the momentous negotiations which resulted in the establishment of the Dominion of Canada in 1867. He also was largely responsible for the adoption of the principle of centralization—the chief difference between the Canadian federation and the United States—whereby all powers not specially conferred on the provinces are reserved to the central government.

For his share in the great achievement of federation Macdonald received two signal honors—he became the first premier of the new Dominion, and he was knighted by Queen Victoria. In 1870 he was one of the British commissioners sent to Washington to settle the *Alabama* claims and the fisheries dispute. He was forced to resign office in 1873, but less than five years later he was again back at the helm, where he remained until his death.

**MACDOWELL, EDWARD A. (1861–1908).** In the history of music Edward MacDowell was the first American composer to win a place beside the great European masters. Although he received most of his training in Europe, it was in his native land that his poetic sensitiveness to beauty found its chief expression, and his most-loved compositions are those which show distinctly American influences.

Born in New York City of Scotch-Irish ancestry, he began to take music lessons when he was eight, but, like many another boy, was inclined to neglect his practising. Sometimes he stopped doing his exercises to improvise pieces of his own or to decorate his music books with pictures. There was some question as to whether he would become a painter or a musician.

When he was 15 his mother took him abroad to study. At the Paris Conservatory he was a fellow pupil of the French composer Debussy. Later, in Germany, he studied under the great composer, Joseph Joachim Raff. MacDowell's genius had begun to show itself, for Raff said to him, "Your music will be played when mine is forgotten." At 20 the young American musician became an instructor in the Conservatory at Darmstadt. As a private instructor in Frankfurt he had as one of his pupils an American girl named Marian Nevins, who became his wife.

When, after a dozen years in Europe, MacDowell returned to America, he had already won some fame as a pianist and composer. His work showed the influence of German romantic music, but he now became more individual, more American in his expression. The beauty of Nature, whether in the form of a simple flower or in its larger aspects—the woods, the vast ocean, the quiet splendor of the sunset—inspired in him moods which he translated into music distinguished for its creative imagination, its flawless structure, and its tone color.

In 1896 MacDowell was appointed to the newly established professorship of music at Columbia Uni-

versity, where he remained until 1904. The last years of his life were marked by failing health of body and mind. He had acquired a tract of wooded farm land near Peterborough, N. H. There for many years he spent his summers and found peace and rest from the nervous strain of teaching, and there many of his finest compositions were written. In fulfillment of a wish expressed during his last illness, and as a memorial, Mrs. MacDowell, with the aid of friends and music lovers, converted this estate into the MacDowell Colony. Here not only composers, but writers, painters, and sculptors spend their summers and find inspiration and opportunity for creative work.

Among MacDowell's works are 'Woodland Sketches'; 'Indian Suite'; 'Sea Pieces'; 'Sonata Eroica'; 'Sonata Tragica'; 'Norse Sonata'; 'Keltic Sonata'; symphonic poems—'Hamlet', 'Lancelot and Elaine'; many songs. Lawrence Gilman's 'Edward MacDowell' is a good study of his life and work.

**MACEDO'NIA.** Scarcely a relic is left today of the days of Macedonia's greatness, when under Philip of Macedon in the 4th century B.C. it suddenly shot up to the mastery of Greece. Only a few fragments of masonry remain to indicate the site of its capital, Pella, whence Philip's son Alexander set out to conquer half the world (*see* Alexander the Great).

As a definite territorial and political unit there is today no such place as Macedonia. It is only a general name for that little region of the rugged Balkan Peninsula where Greece, Bulgaria, and Yugoslavia meet. Small as it is, with a population between 2,000,000 and 3,000,000, it has been one of the storm centers and war breeders of the world.

Here dwells such a medley of races as is found in few places in the world. Turks, Slavs, Greeks, Bulgars, Jews, Albanians, Gipsies, Vlachs, and Circassians live in mutual hatred, speaking a dozen tongues and practising seven hostile religions. The most important city, Saloniki, now belongs to Greece.

During the closing years of the 19th century and the opening years of the 20th, the history of Macedonia was a series of intrigues by the more powerful races, each striving to gain the upper hand and to dominate the region when it should shake off the hand of the Turk, who had held it since the 15th century. Frequent uprisings were followed by savage massacres, until finally the whole seething Balkan question boiled over into the wars of 1912–13, which were waged largely for the possession of Macedonia and the outlet to the sea that it affords.

At the close of the Balkan Wars and the World War of 1914–1918, the greater part of Macedonia was divided between Greece and Yugoslavia. Bulgaria retained only a small strip along the Struma River. After a few years Greek Macedonia became populated almost entirely by Greeks, through exchange of populations with Turkey; but Yugoslav Macedonia was still a racial problem. Yugoslavia classed this population as Serb, but many of these people called themselves Bulgars. Bulgaria for years had been the center of a movement for Macedonian independence, and after 1919 large numbers of Macedonian revolutionists fled to Bulgaria (*see* Bulgaria). From there bands of guerillas, or *comitaji*, conducted a long series of troublesome border raids. The word *comitaji* means committeeman, and refers to the revolutionary committees of Turkish days. (*See* Balkan Peninsula.)

## GUNS that Fire FIVE SHOTS a SECOND

**M**ACHINE GUN. "Tac-tac-tac-tac!" This sharp, rattling bark is the most fearful sound of war—far more fearful than the irregular crack of rifles or the "Grmpf!" and "Wham!" of exploding shells. It is the voice of the machine gun, the deadliest killer of all, because it can cover a field with bullets at the rate of five a second as long as ammunition lasts. Attackers have no choice but to seek immediate cover, until their artillery can destroy the machine gun, or until they can "smoke it out" with bombs or cautiously stalk its crew.

The deadly fire of this weapon is one of the major factors which transformed warfare during the World War of 1914–1918. A small number of machine guns scattered along a front could hold up attacks by entire regiments. This new weapon, added to intense modern artillery fire, made the old-style infantry attack, ending with a bayonet charge, too dangerous to be tried by any commander. Attacks can now be delivered only after supporting artillery has suppressed the enemy guns. And even then tanks must often lead the assault in order to destroy any remaining machine guns before the infantry can successfully advance over open ground.

### Early Automatic Weapons

Ever since firearms were invented, men have sought guns that would shoot faster than the single-shot weapon which had to be reloaded every time it was fired. Partial success was achieved in 1861 with the Gatling gun, invented by Dr. R. J. Gatling of Indianapolis, and with the French *mitrailleuse*, invented soon after. Both had a number of barrels that fired in turn as they were revolved around a central axis by a hand-turned crank. Sir Hiram Maxim, an American-born inventor working in England, was the first, however, to invent a completely *automatic* weapon that loaded and fired itself after the first shot, as long as ammunition was supplied.

This invention came in 1881. In an improved form called the Vickers-Maxim, it was largely used by the British in the World War of 1914–1918. Other types are the heavy Hotchkiss and the light Chauchat, both used by the French army, the Schwarzlose of the Austrian and German armies, and the Madsen light gun used by Norway, Sweden, and Denmark.

### Modern Types and How They Are Classified

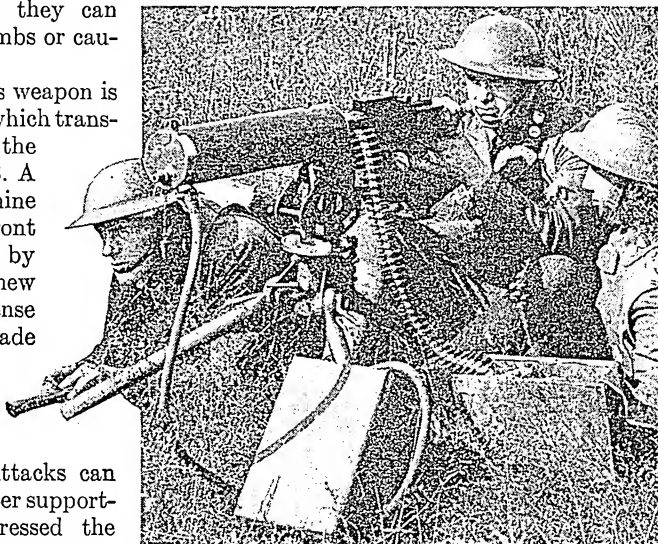
The Lewis gun, invented by Col. Isaac N. Lewis of the United States Army, was extensively used by France, Great Britain, and the United States Navy in

this same conflict. In 1918 the United States Army adopted both light and heavy machine guns invented by John M. Browning. The light Browning machine rifle can be fired from the shoulder. It weighs 15 pounds and fires a clip of 20 cartridges in 3 seconds, with one pressure of the trigger. The heavy Browning gun weighs 37 pounds and fires a belt of 250 cartridges. It is water-cooled, and can maintain a fire of 20,000 shots an hour.

In 1935 the British army went outside its national resources to adopt the Bren machine rifle developed in Czechoslovakia.

The term "machine gun" is now reserved for a weapon provided with a fixed mount. Automatic weapons that can be fired from the shoulder or hip without a rest are called automatic rifles or machine rifles. These may be fully automatic or only semi-automatic. The latter type reloads itself, but the trigger must be

A HEAVY BROWNING MACHINE GUN



This heavy machine gun is one of the deadliest of modern weapons. With it a crew of three men can stop a regiment.

pulled for each shot. An excellent example of this type is the Garand rifle of the United States Army (*see Firearms*). The machine gun requires a crew of men to carry ammunition and accessories.

Machine guns and rifles are classed according to two features: they may be air-cooled or water-cooled; and the action may be kept in motion either by the force of recoil from each explosion, or by using part of the gas that drives each bullet in a reloading and firing mechanism.

Before 1914, because of the immense quantities of ammunition required for machine guns, military authorities issued only a few to a regiment. Stabilized trench warfare, with the ability to keep guns supplied, caused rapid expansion in their use. They were also adopted by air forces for use in airplanes. Some types are synchronized with the propeller to fire through the propeller area when the blades are out of the way; the pilot keeps his airplane pointed at his target when firing. Other combat airplanes and bombing aircraft have machine guns that can be aimed and fired from mounts. The lighter guns on aircraft are about .30 caliber, and use infantry rifle ammunition. The heavier .50 caliber guns are able to pierce light armor. These heavy guns are also used on the ground to fight off low-flying airplanes, and for defense against light tanks.

## How a Typical Machine Gun Works

THE HEAVY Browning machine gun shown on the opposite page is water-cooled, and is operated by the force of recoil from each explosion. It has a tripod mount, and ammunition is fed from a belt. The large cylinder on the front is the water jacket. This takes off heat, which is generated in the barrel by rapid firing, by using the heat to make steam. The steam passes through a hose to the canlike condenser at the left. If the steam escaped into the air, it might betray the gun to the enemy.

The main parts of the gun, somewhat simplified to make them more readily understood, are shown in Fig. 1. Its construction can best be understood, however, by tracing the various operations step by step.

Fig. 2. How the Bolt Action Operates

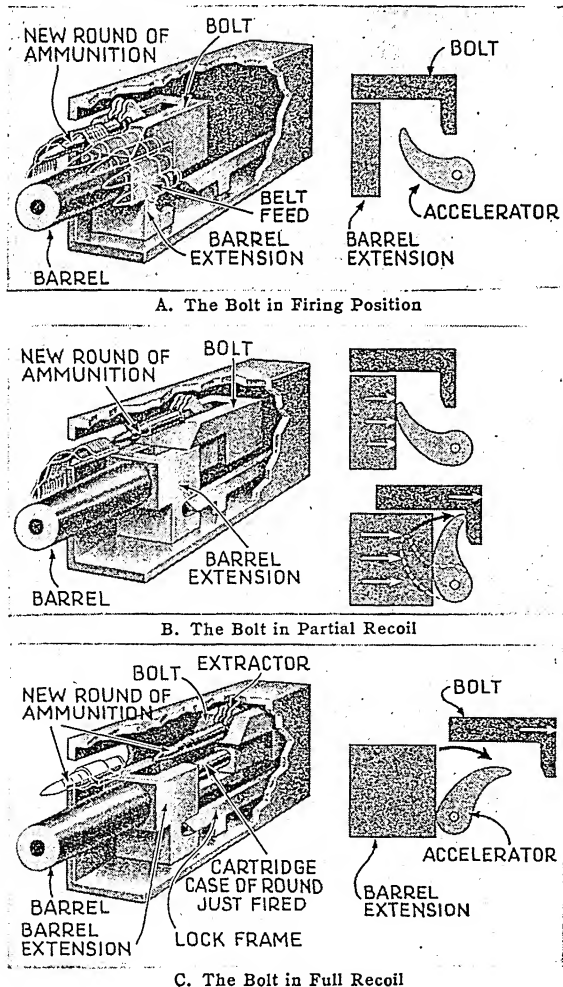


Fig. 1. The Principal Working Parts of the Browning Machine Gun

How Recoil Is Used to Work the Gun.—The operation of the gun is centered around the mechanisms shown in Fig. 2. The first piece of mechanism to notice is the barrel with its attached piece, the barrel extension. A second important piece is the bolt. A third is the driving spring, which is attached, as shown in Fig. 1, to the top of the bolt. Together, these three mechanisms absorb the recoil or "kick" from each shot and use its force to work the gun.

At the instant a shot is fired, these mechanisms are all together and well forward, in their firing positions (Fig. 2, A). The bolt, which contains the firing mechanism, holds the cartridge firmly while it fires. Then the recoil from the explosion starts driving these mechanisms back, and the bolt starts compressing the driving spring. At the same time, an extractor starts drawing a new cartridge from the belt.

All these parts together have considerable weight and so this first motion is relatively slow and does not jar the gun. Greater speed is needed, however, for the rest of the operations, shown in Fig. 2, B and C.

The barrel and the barrel extension cease their backward motion when they hit the stop, which is part of the lock frame shown in Fig. 2, C. Just before this happens, a cam on the stop has struck a lock (not shown in the diagram), which, up to now, has held the bolt fastened to the barrel extension. This releases the bolt from the barrel extension. Thereafter the bolt is driven backward still farther. The driving is done by the curved accelerator, which at the instant of firing lies as shown at the right of Fig. 2, A. These diagrams at the right in each part of Fig. 2 show the interaction between barrel extension, accelerator, and bolt.

When the barrel extension recoils after a round is fired, it hits the accelerator and tips it backward. The tip of the accelerator starts moving toward the projection from the bottom of the bolt, but it does not strike until after the bolt has been unlocked from the barrel extension (Fig. 2, C). Then the barrel extension gives the accelerator a final push, and the accelerator throws the bolt backward.



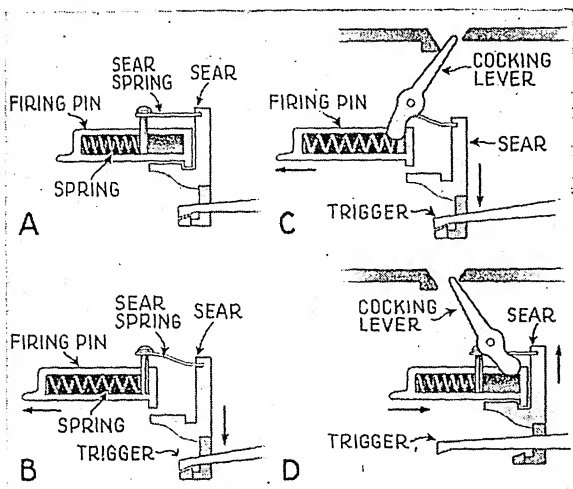


Fig. 3. The Firing Mechanism

The bolt continues to fly backward until it encounters a stop on the rear of the case. Then the driving spring, which has been strongly compressed, starts to drive the bolt forward again. Thereupon all the previous actions are reversed, until all the pieces come together again in firing position.

**Reloading.**—During this sequence of motions the gun has also been reloaded. This action started with extraction of a new round from the belt, as shown in Fig. 2, A. When the bolt is forced back from the barrel extension, it also pulls back the cartridge case of the expended round. At the proper moment a mechanism (not shown here) knocks the case out of the way.

When the bolt is fully back, a cam drives the new round down into line with the firing chamber. As the bolt moves forward, it pushes the round into position to be fired.

**How the Gun Is Fired.**—Before the gunner pulls the trigger for the first shot, the firing mechanism inside the bolt is in the position shown in Fig. 3, A. The firing spring is inside the firing pin, pressing against the sear spring pin at the back. A portion of the sear holds the rear end of the firing pin. The sear is held up in this position by the sear spring (3A).

Now the gunner pulls up the rear end of the trigger to fire the first shot. This depresses the front end of the trigger, and pulls down the sear and the sear spring (3B). This frees the firing pin which drives forward and fires the round (3B).

As the bolt recoils after the shot is fired, it carries the firing mechanism back with it. Thereupon the cocking lever (Fig. 3, C) prepares the mechanism for the next shot. This lever is pivoted to the bolt and moves with it. Moreover, as long as the bolt is forward, the upper end of the cocking lever is held in a slot in the case. Hence this end stays in place when the bolt starts back, and it compels the lever to pivot as shown and move the lower end backward against a flange on the firing pin. This drives the pin backward and compresses the firing spring. When the

rear end of the pin comes over the notch in the sear, the sear spring pulls the sear up, and thus locks the pin. But now the bolt starts forward again, and when the projection from the bottom of the sear comes into contact with the trigger once more it is thrust downward, thus releasing the firing pin again (as in Fig. 3, C), firing another round. And so the action continues, as long as the gunner holds his pressure on the trigger.

**How Ammunition Is Supplied.**—The movement of the ammunition belt by means of the belt-feed lever is shown in Fig. 4. This lever is pivoted to the cover of the case, and stays in place while the bolt moves back and forth beneath it. It can move from side to side, however, on its pivot—and this motion is used to push the ammunition belt along across the top of the gun, as shown in Fig. 4 (A, B).

The side-to-side motion is timed by a stud which rests in an S-shaped groove on the upper surface of the bolt (4A). When the bolt recoils, the curving groove forces the stud to the right, and the front of the lever carries a slide to the left (4B), over the cartridge belt. Inside the slide a belt-feed pawl and spring are held, as shown in 4C, until they come to the left of the new round. Then the spring forces the pawl down, as shown in 4D.

As the bolt moves forward from the full recoil position, it reverses the movement of the belt-feed lever, and pushes the slide back toward the right. But the pawl now pushes the new round to the right as well, into a position where the extractor can grip it. The extractor does so the moment the bolt comes into firing position—and then everything is once more ready to fire a round, and start the entire sequence of motions over again.

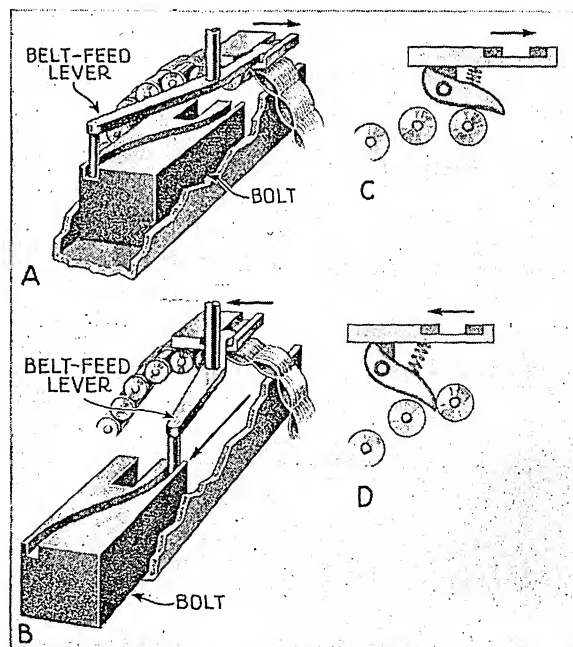
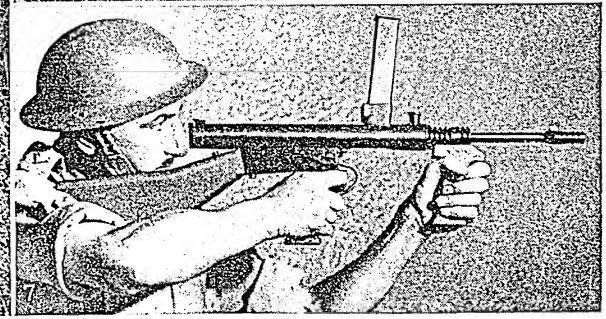
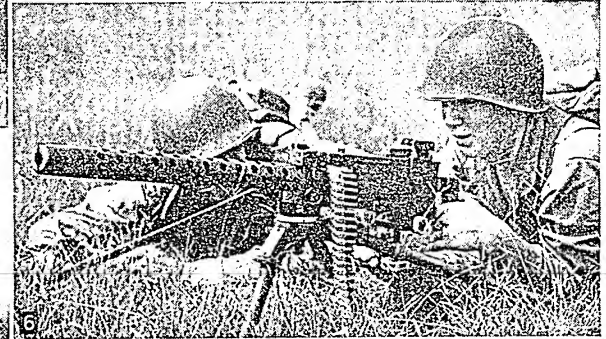
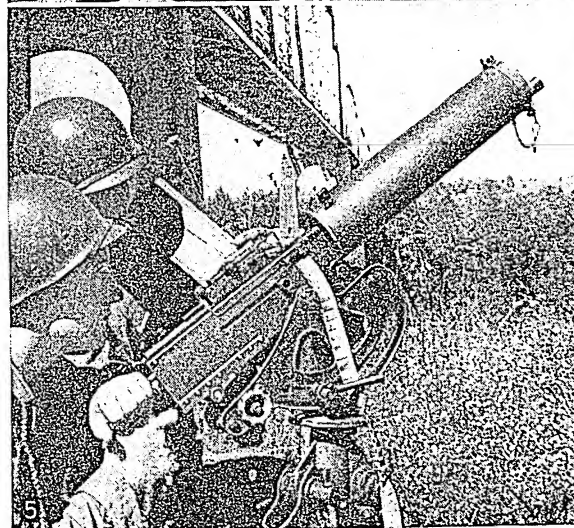
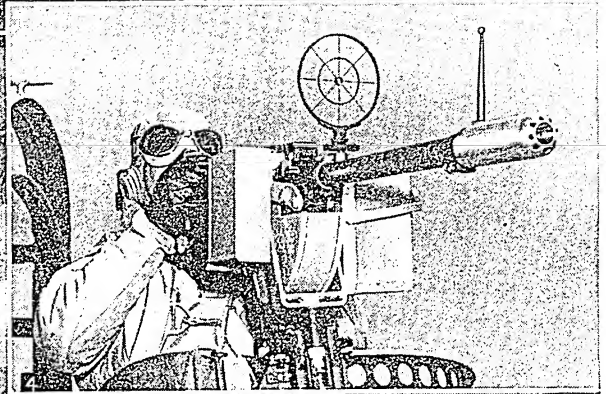
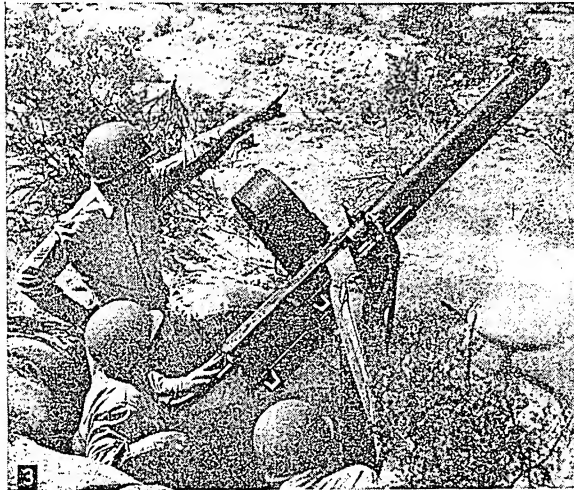


Fig. 4. Moving the Belt to Feed Ammunition

## MACHINE GUNS AND RELATED WEAPONS



Here are leading examples of machine guns and automatic cannon used in the second World War. 1. A British crew and its Bofors cannon. This gun can fire more than a hundred 40-mm. shells a minute. 2. A navy Oerlikon gun ready to blast enemy aircraft with several hundred 20-mm. shells a minute. 3. An American .50-caliber, water-cooled Browning machine gun. 4. A .30-caliber, air-cooled Browning, mounted on an airplane, with a flash reducer on the muzzle, and a large airplane sight. 5. A .30-caliber, water-air-cooled Browning. 6. A .30-caliber, air-cooled Browning. 7. An Australian invention, the Owen submachine gun.

**MACHINERY.** Machines are man's answer to the ever-present problem of securing greater results in the time allotted for a task. They are something more than tools, by which man supplements the power of his hands. In the physical sense, most tools are simple machines, for they enable a man to produce more work with less energy (*see* Physics). But, practically speaking, a machine performs repeatedly a complicated and more or less complete task at an actual saving of time and labor.

We are often told that this is a machine age, and that machines are dominating life to an ever-increasing extent. It is true that they have become so important in our lives that there is scarcely anything we make or use that is not touched by the machine. Instead of a simple, self-contained primitive existence, in which each family produces for itself most of those things which it needs, machines have made life an "assembled" affair, to which many machines must contribute. We wake to the ringing of a machine, eat a breakfast cooked over gas pumped into our homes by a machine, read newspapers printed by marvelous machines on paper made by still more wonderful machines, and ride to business in machines.

Our dependence on them is such that the breakdown of a single generator in a power house may deprive a whole community of light, heat, refrigeration, water supply, transportation, the power to perform ordinary household tasks, and possibly the means of livelihood itself.

#### How Machines Have Brought Leisure

But this dependence upon machines for simple acts of daily life is but one aspect of the Machine Age. Machines have brought us leisure, and the means whereby to enjoy it. They are labor serving, rather than labor saving, in this respect, for they have lessened the hours of man's toil, and enabled him to perform more work, and to secure for himself the benefit of that labor and the cultural results of the leisure he thus obtains by producing more work in fewer hours.

The fact that machinery has enabled the United States to perform one-half of the work done in the world, when the country contains only one-sixteenth of the world's population, is but one proof that material prosperity and leisure are served by machines. An average worker in the United States produces 30 times the work of an average worker in China, where hand methods are still in vogue.

#### Utilizing Natural Resources

Modern business is an expression of the wealth-creating power of machinery, and it is equally at the mercy of machine development. There are industries, once thought essential, which have sunk to relative insignificance by the introduction of machines and new methods of production. Science, working hand in hand with business, has devised methods of utilizing the natural resources of the world through machinery, with the result that mere man power and animal power have been almost supplanted by energy produced from

water, coal, and oil (*see* Power). With the almost unlimited energy thus available, business has been able to embark on programs of mass production impossible with hand methods. For example, one American plant making automobile frames with automatic machinery employs 200 men and produces about 7,000 frames daily. Contrast with this a European plant, which also employs 200 men but produces only 35 frames a day using hand methods.

#### Do Machines Supplant Human Labor?

It has been charged that machines thus supplant the labor of men, and that a growing use of machinery results in a steady decrease in employment. However, in 1890, when industry was only partly mechanized, 36.1 per cent of the population of the United States was gainfully employed. In 1930, 39.8 per cent of the population was at work for salaries or wages. This would indicate that the use of machinery does not decrease employment. More men are required to manufacture the machines themselves, to supply them with raw materials, and to transport and market the ever-increasing stream of finished products poured forth from more and more machines. Machines tend to lower costs, with a consequent reduction of prices, which in itself widens the market by making the goods available to a larger number of people, increasing demand and bringing still more goods within the range of people's pocketbooks. (*See* Economics.)

It can be charged to machinery, however, that it shifts employment; and its introduction may tend to upset conditions of employment for a time, until workers have been placed elsewhere in the complex organization involved in production, distribution, and sale. This is known as technological unemployment. (*See* Industrial Revolution.)

#### Mass Production and Overproduction

Mass production by machinery has been blamed for periods of economic depression; but economists are by no means agreed that overproduction is to blame. It may be that men, in their increasing use of machinery, have failed to take advantage of the leisure to which the machine entitles them, and by working too long hours are encroaching upon the status of other workers. Whatever may be the truth, overproduction is a misuse of the machine's function, which is the satisfaction of man's needs, and is not a fault of the machine itself. Some regulation of production will not affect the utility of machines if it has a basis in social and economic justice. They will continue to be of service to men.

It was this service to mankind that led to the development of the first machines. Simple ones, such as the lever, the wheel, the inclined plane, the screw, and the wedge, have been known for ages. At first these constituted the only machines, and by them men could do more work than with their unaided hands. In essence, they were basic mechanical methods which are applied to even the most complicated mechanisms.

The very name first applied to machines—*engines*—signified something that produced within itself.



There were engines of war, such as the *ballistae* (catapults) which could cast stones farther than men could hurl them, rams which could batter down walls otherwise impregnable, and peace-time applications of these and other basic mechanical principles. When steam was discovered as a source of power, the term engine came to be used only to signify machines capable of developing power by steam. With the advent of the internal combustion engine, the word has been extended to include all prime movers, or machines that transform heat energy into power. The electric motor, thus, is not considered an engine, as it takes energy already produced by a generator. The term engine is also applied to machines which produce fine divisions or calibrations on scales, precision tools, and scientific equipment; and we also have the term "engine turning," applying to the production of intricate designs on watch cases and on plates for printing currency and securities.

In the modern sense a machine differs from a tool, being more complex, and repeating its operations over and over again. It would be impossible to list even the classifications into which machines fall, or to describe their complexities, and yet every one is only a combination of simple machines in the mechanical sense in which we use the word. The automobile is composed of screws, levers, wheels, inclined planes, wedges, and so on. The cylinder head, for instance, is held tightly to the cylinder block by a series of bolts (screws). The connecting rods are levers, pushing against the crankshaft; the timing gears are special forms of the wheel; the inclined plane is found in the cooling fan, for its blades push a load of air; while brakes are sometimes operated by wedges.

The automobile is a splendid example of the modern machine, for it is the product of scores of specially designed machines and of processes that came into existence for the sole purpose of aiding in the production of motor cars. Itself a machine, it has been responsible for other machines, for special materials, and for auxiliary parts and processes that have

contributed to progress in other respects since their first use in motor cars. (See Automobile.)

A high degree of precision has been developed in the automobile business, particularly in the finishing of parts, both to reduce wear and to make it possible to assemble and replace parts that will fit accurately without hand work. This is a characteristic of modern machines, which are made to an amazing degree of accuracy, and are capable of producing work within

tolerances narrower than the ten-thousandth part of an inch.

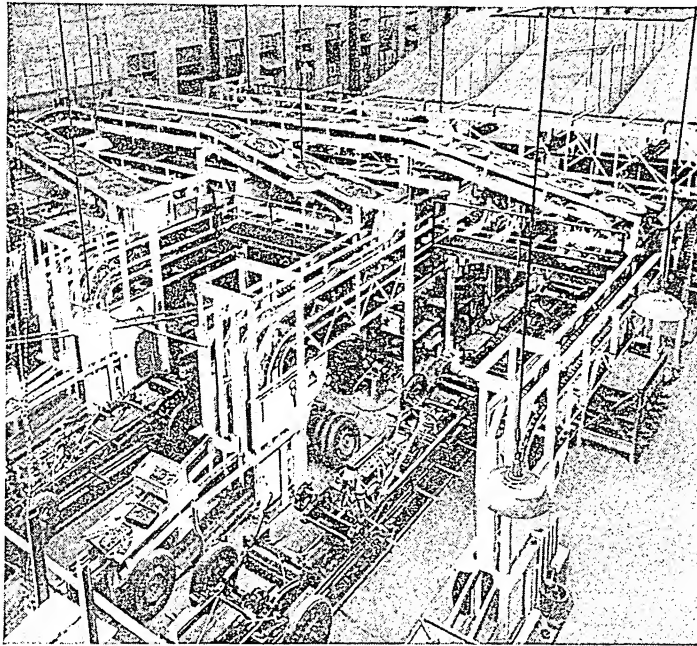
This uniformity of production, required by modern business, and made possible by the machine, compels the manufacturer to exercise rigid inspection over production. Skilled help to operate machines is still a necessity, which is one reason why manufacturers using mechanical methods are likely to locate in districts with similar manufacturers. Detroit is the center for automobile production; Akron for rubber goods; Troy, N. Y., for laundry machinery; and textile manufac-

turers tend to center in certain New England and Southern districts.

#### Machine Tenders Replace the Craftsman

But with this experience in machine tending has come a lessening of the supply of skilled craftsmen capable of performing all operations in the manufacture of a product. Except in a few cases, no longer does a shoemaker fashion an entire shoe, nor a gunsmith produce a rifle, lock, stock, and barrel. Rather, skilled machine tenders preside over countless operations, each doing infinitely well and with great speed, a single detail in manufacture. There is a constant tendency in industry to utilize the machine more and more, particularly in combining various operations and processes into one machine handling. We thus have cable-making machines that take bare wire and turn out finished cable, and machines that not only produce a product but wrap it and package it as well, and many others. (For further discussion of common tools and machinery that performs definite operations see Automatic Devices; Mechanics; Tools.)

ASSEMBLING AUTOMOBILES BY MACHINE



The automobile is itself a complex machine, and in its manufacture many other machines, as well as complicated tools, are used. On such great machines as these shown in the picture are the automobiles assembled. The various parts are brought together automatically, placed in position, and a minimum of hand labor with tools assembles them, a task that would be impossible without the accuracy of modern tools and the perfection of machines.



**MACKENZIE RIVER.** The greatest river of Canada and the second greatest in North America, the Mackenzie, flows about 2,400 miles from its source in the Rocky Mountains to the Arctic Ocean. It drains an area which is 100,000 square miles larger than the basin of the Great Lakes and the St. Lawrence. In its course it gathers the waters of three immense lakes—two of them larger than Lake Erie—Lake Athabaska (2,850 square miles), Great Slave Lake (about 11,200 square miles), and Great Bear Lake (11,500 square miles). Great Bear Lake lies so far north, partly within the Arctic Circle, that its surface is frozen for nine months of the year.

From its source to Lake Athabaska, this mighty river is known as the Athabaska River; thence to the Slave Lake, as the Slave River; and from there on to its mouth as the Mackenzie. In summer steamboats of the Hudson's Bay Company travel from Slave Lake almost to the river's mouth, where it spreads into many branches flowing through a wide flat delta. The Athabaska and its other great tributaries, the Peace and the Liard, are navigable much of their length for steamboats of shallow draft. Nowhere is the Mackenzie proper less than half a mile wide, and in its widest reaches it expands to three and four miles. Most of its course is through virgin wilderness, heavily wooded in many of the upper parts, a paradise for sportsmen and trappers. Large deposits of oil have been discovered on the Mackenzie only 150 miles south of the Arctic Circle.

The Mackenzie River was named for Sir Alexander Mackenzie (1755–1820), a Scotchman in the employ of the Northwest Fur Company, who in 1789 explored the river to its mouth and three years later crossed the Canadian Rockies to the Pacific, the first white man to accomplish the trip.

**MACKENZIE, WILLIAM LYON** (1795–1861). As inspirer and leader of the unsuccessful rebellion of 1837, William Lyon Mackenzie occupies a place in Canadian history much like that of Daniel Shays and John Brown in the history of the United States. Honest in purpose, aflame with righteous rage at intolerable evils, but hasty and fanatical in temper, he flung counsels of prudence to the winds and took up the sword to cure the ills which afflicted Upper Canada (Ontario). The rebellion itself was crushed almost before it started, but it hastened by years the redress of the grievances which provoked it.

Mackenzie had come to Canada from Scotland at the age of 25, after a youth of poverty and toil. He found in Upper Canada increasing discontent against the autocratic rule of a stubborn Tory governor and a small political clique, nicknamed the "Family Compact," which monopolized public office. A born agitator, Mackenzie threw himself heart and soul into the struggle. First at Queenstown, then at Toronto, he published a newspaper, *The Colonial Advocate*, in which he assailed the office-holding class and demanded governmental reforms. Just as he was on the point of ceasing publication for lack of funds, a mob

wrecked his printing office, and the heavy damages awarded him by the courts enabled him to start anew. His last paper was named *The Constitution*. Five times elected to the parliament of Upper Canada, he was five times expelled by his political foes. In 1834 he was elected first mayor of Toronto (formerly York) and was returned to parliament, this time being allowed to take his seat, since the Reformers were now in the majority. Two years later, trickery and bribery again swung the elections against the Reformers, and Mackenzie soon began openly to advocate a republican form of government, working hand in hand with the Reformers of Lower Canada (Quebec) who were already planning revolt (see Papineau, Louis Joseph).

On Nov. 25, 1837, Mackenzie proclaimed a provisional government for Upper Canada and by Dec. 7 he had gathered a force of 800 or 900 insurgents near Toronto. The rebels were speedily routed by the government forces, and Mackenzie fled across the Niagara frontier to the United States. Seizing Navy Island in the Niagara River, he troubled the Canadian frontier for a few weeks, but was captured by the authorities of the state of New York and imprisoned for breach of the neutrality laws. He was released a few months later and remained in the United States until 1849, when the passage of an amnesty act allowed him to return to Canada. From 1851 to 1858 he was a member of the Canadian parliament, allied with the extreme Radicals.

**MACKEREL.** Next to cod and herring, the mackerel is the most important food fish of the North Atlantic. It is a smooth, regularly formed fish with a deeply forked tail, characterized by its beautiful protective coloration—bluish green above, mottled or barred with black, and iridescent silver beneath. The scales are very minute and are absent from the head. Although there are very few species, mackerel have a wide range and are found in shoals, sometimes of immense size, in nearly all tropical and temperate seas. They spawn in the open sea, but migrate periodically towards the shore in pursuit of the shoals of myriads of small crustaceans, which form their principal food. They also eat young fish and eggs.

In the New England states, Nova Scotia, and California, and in Norway, Ireland, and Great Britain, mackerel fishing is an important industry. In Europe and California small boats and hand-lines are used, but in the American Atlantic fisheries most of the fishing is done from sea-going schooners equipped with purse-seines, by means of which whole schools can be captured. The fishing begins in April and the spring catch is generally sold fresh, while the summer catch is split and salted for the market. (See Fisheries.)

The common mackerel of the North Atlantic (*Scomber scombrus*) is usually from 14 to 16 inches long and weighs about three pounds. A closely related species is the somewhat smaller Pacific mackerel (*Pneumatophorus diego*). Its annual catch rivals that of the North Atlantic fish.

**MCKINLEY, MOUNT.** "I would rather climb that mountain than discover the richest gold mine in Alaska," exclaimed Archdeacon Hudson Stuck, as the splendid vision of this highest mountain of North America, rising in majestic whiteness to a height of 20,300 feet in south-central Alaska, spread before his eyes. The steep ice-polished slopes, the terrible cold, and the dangerous thin air did not deter him, as they had not deterred others before him. Finally in June 1913 he succeeded where others had failed, and stood

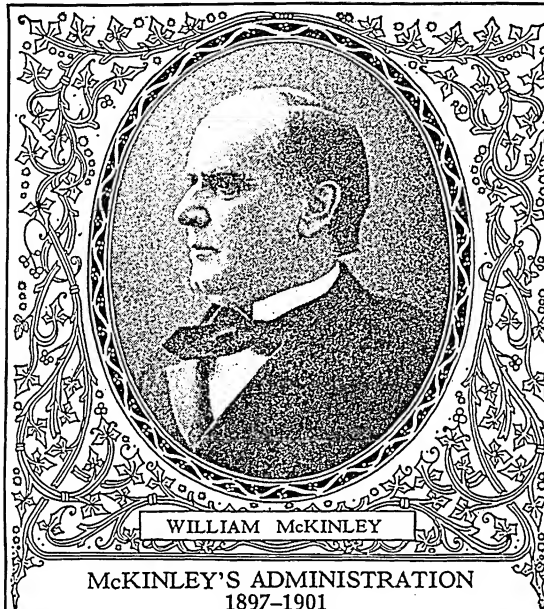
the first on the top of the continent—"alone upon a dead world, as dead as the mountains of the moon." The snow-covered mountains around, he reports, "dwindling and fading, arose to our view as though floating in thin air," and above "the sky took a blue so deep that none of us had ever gazed upon a mid-night sky like it before."

Denali or Traleyka is the native name for the mountain. In 1896 it was renamed in honor of President McKinley, and in 1917 it was made a national park.

## MCKINLEY—WAR PRESIDENT *and* MARTYR

**MCKINLEY, WILLIAM** (1843-1901). The gentle soul of William McKinley of Ohio, 24th president of the United States, left on the men who knew him an impression that time did not efface. On his birthday, January 29, they still wear the red carnation that was his favorite flower. His invalid wife, who outlived him, was their special charge until her death. They built him a mausoleum at Canton, Ohio, that has become a place of pilgrimage. And the tragic nature of his death, at the hands of an anarchist, emphasized for them the usefulness of his life, the kindness of his manner, the tolerance of his policies.

Less able than Harrison, less steadfast than Cleveland, less inquisitive and venturesome than Roosevelt, President McKinley understood the people of the United States and the men whom they elected to make their laws. Within the four years of his high office, he drew the sections together, doing much to heal the sores of the Civil War. Himself a member of Congress for 14 years, he knew how to lead that body to work with him in good temper. His appointments were often distinguished for their excellence. And his sympathies were so gracious that even his bitterest opponents found it hard to stay angry long enough to fight him. He helped to ease the United States through the difficult transition from small affairs to



### MCKINLEY'S ADMINISTRATION 1897-1901

Dingley tariff passed (1897).  
Gold discovered in Alaska (1897).  
Marconi makes "wireless" practicable (1897).  
Battleship 'Maine' blown up in Havana harbor (Feb. 15, 1898).  
War with Spain follows (1898).  
Philippines, Porto Rico, Guam, and Cuba acquired by Treaty of Paris (1898).  
Hawaiian Islands annexed (1898).  
Samoan Islands divided with Germany (1899).  
Philippine insurrection suppressed (1899) and civil government prepared for.  
United States participates in First Hague Peace Conference (1899).  
Secretary Hay secures "open door" policy in China (1899).  
Troops sent to China to aid against Boxer uprising (1900).  
Gold standard adopted (1900).  
McKinley reelected on "full dinner-pail" platform (1900).  
Assassination of McKinley (Sept. 6, 1901).

big business, from the flexibility of open opportunity to the rigidity of economic and social classes, from local interests to world affairs.

In another way McKinley marked a transition, for he was the last of the presidents whose political careers were founded on military service in the Civil War. Born at Niles, Ohio, he went to public school for a time, and then worked for his father in the iron foundry established by his Scotch-Irish grandfather. He attended Allegheny College for a year, but withdrew on account of bad health and for several terms tried teaching school. In the spring of 1861, although only 18, he promptly volunteered, and was mustered into service in the 23d Ohio Volunteers. At Antietam his gallantry was cited by Rutherford B. Hayes, then colonel commanding his regiment, and won him a commission.

At the end of the war the 22-year-old major (for he had been gradually promoted to that rank), studied law for two years, and began to practise in Canton, Ohio. There, in 1871, he married Ida Saxton, daughter of a prominent

local family. The shock of the early deaths of their two daughters left Mrs. McKinley a nervous invalid, to whom McKinley for the rest of his life devoted the time that other men allotted to recreation or to society. Ever dignified and serious, and never learning

how to play, McKinley worked at law and politics, and at the age of 34 appeared on the national stage as a representative at Washington, in the administration of his friend and war commander, President Hayes.

#### Early Political Career

During the seven terms of his career in Congress, McKinley rose steadily in the organization of the Republican party. He never questioned that the party was always right. His constituents in Ohio were manufacturers, and their interest in a protective tariff led him to vigorous support of protection as a party principle. He early studied the subject, believing that after the confusion of the Reconstruction years the tariff would come to be a major problem. As it grew in importance, he grew with it. He wrote the platform of the Republican party in 1884 and in 1888, and was made chairman of the committee on ways and means in the Congress that met in 1889. The McKinley Tariff, passed in 1890, was the first systematic revision of the tariff in the direction of protection to all American manufactures. McKinley, whose name it bore, was the best known of the tariff statesmen; and when the Democratic party made war on protection and repealed the bill in 1894, McKinley was the obvious man to restore it. The panic of 1893 struck the United States at the moment when the Democrats were reversing the tariff policy, giving Republican leaders an opportunity to blame them for causing it.

During the years of depression, McKinley, then governor of Ohio (1891-95) and "advance agent of prosperity," aimed at the Republican nomination for the presidency in 1896. He was supported in this ambition by Marcus A. Hanna, an Ohio business man and political leader, who loved McKinley for himself, favored him as spokesman for protection, and spent his private means to advance his friend. McKinley and Garret A. Hobart, of New Jersey, were nominated as the Republican ticket at St. Louis in June 1896. But the fight for election proved to be on an issue other than the tariff: "free silver" was the issue before the country, and to it all other problems were subordinated as the presidential campaign progressed.

#### Free Silver; 16 to 1

"Free silver" was the slogan of the Populists, a hard times party, that demanded more money in circulation, and cheaper money, so that the debtor farmer might receive higher prices for his produce and find it easier to pay his debts. Already the pressure from West and South had forced upon Congress in 1878 the Bland-Allison Act, and in 1890 the Sherman Silver Purchase Act. Free silver, as now demanded, meant that although enough silver to make two dollars could be bought for one dollar in gold, making the silver dollar actually worth but 50 cents, the United States should continue to make the silver dollar at the same old weight, fixed when one ounce of gold was worth only 16 ounces of silver. This was "16 to 1." The "free" meant that the mint should coin freely at this ratio (16:1) all silver brought to it,

and that there should be no check upon the amount of silver money except the total output of the silver mines. In other words it was unlimited coinage.

McKinley was elected president in 1896, after a bitter canvass in which the parties divided on lines of social and economic classes more than ever before. William Jennings Bryan, the Democratic nominee, was the great orator for free silver, and had the support of people in sections that were poor because of the panic, or depressed because of debt. Behind McKinley were the sections and people who were well off, who feared a 50-cent dollar, and who thought that it would be dishonest for the United States to pay its debts in money of only half its usual value. The issue of protection, upon which McKinley had built his earlier reputation, had already brought within Republican ranks most of the wealthy manufacturers. Republicans said that Democrats and Populists wanted to repudiate their debts; Democrats answered that the Republicans had become a party of entrenched wealth and corrupt privilege for special interests.

The election returned a Congress Republican in both houses, so that during the next four years McKinley could fulfill party pledges as to both sound money and the protective tariff. More than this, the party that elected McKinley was so strengthened by victory, and the party of Bryan was so weakened by defeat and internal quarrels, that for 14 years after 1897 there was unbroken Republican control of president, Senate, and House of Representatives. Prosperity had begun to reappear even before election day; it continued on a vast new scale that threw into the shade the last boom period of the 80's.

#### A New Era

The Industrial Revolution, beginning in the 18th century, passed through several phases as it changed the life and habits of society. First, it brought steam to replace wind, water, and the labor of animals as the power that served society. Manufactures and the factory system were its immediate products. Then it brought changes in communication, as steamboats and traveling engines made their appearance in the second quarter of the 19th century. Manufactories indeed continued to increase, but the most visible changes of the second period were in transportation. Then came new inventions, in the application of electricity, to carry the results of the Industrial Revolution into every walk of life. And every new invention made new jobs, and set up new industries, and crowded old cities with new workers to meet the new demands. As McKinley drove along Pennsylvania Avenue in the inaugural parade with Cleveland at his side, a moving-picture camera clicked a record of the spectacle, serving notice that the eye of man was now to extend its range as the ear had done in the previous phase of the Industrial Revolution, through the telegraph, the telephone, and the phonograph.

Man extended his range on land and sea. From the triumph of Alexander the Great until the defeat of Napoleon, the speed of man, on land, was the speed of

his horses. The railroad, in the second phase of the Industrial Revolution, quickened his pace for the first time in centuries. But now, over land, under the sea, and even through the air, new inventions were ready to increase man's command over his environment. The inventors, Holland and Rose, had a submarine boat that was beyond the experimental stage and that was in a few years to make the romance of Jules Verne tamer than reality. Langley, of the Smithsonian Institution, had a flying machine that came near to anticipating the feat of the Ohio bicycle mechanics, the brothers Wright, who glided into the air before the second term of McKinley had run its course. The horseless carriage had arrived. In 1900 the first automobile show was held in New York; only 31 years later a single manufacturer, Henry Ford, had turned out the unbelievable total of 20,000,000 cars.

A new life was to be lived in a new world. Between 1890 and 1930, the United States doubled in population, from 62,947,714 to 122,775,046. Its people were drifting into the cities, their lives losing the variety and exercise that existed on the farm. Recreation and sport were no longer incidental; they must be pursued. Tennis and baseball for the young, golf for the middle-aged, and professional baseball, football, and other diversions for those who took their exercise sitting down, were the necessary equipment of city life. The abundant means that brought these within the reach of ordinary people, brought other things—better homes, a greater variety of clothes, more healthful foods, and more education for more of the children. McKinley lived to see only the beginning of the new period, but he never lost his belief that the government of the United States would enable the people to meet the varied problems of the new life—problems certain to arise in prosperity.

#### The Age of Big Business

Hand in hand with the prosperity of the new age went the organization of the business that managed it. Before 1890, when the Sherman Anti-Trust Act was passed, the people had become nervous about the railroads and the trusts. They had better reason now for more nervousness. Working through the banks that loaned money and financed new companies, many of the ablest men of the United States were becoming money kings. John D. Rockefeller, whose

fortune came from petroleum, was the personification of monopoly in the manufacturing business. J. Pierpont Morgan, head of a banking house in New York, had rescued the Treasury in the hard times of Cleveland, and now took the lead among promoters and money-lenders. James J. Hill and E. H. Harriman were identified with building great railroad systems and consolidating little lines by gigantic mergers. The Sherman law seemed to have no influence on the tendency of business to consolidate, and the men of vast affairs did not want it to restrict their ventures. The successors of McKinley were destined to face the agencies of big business, and were forced to work out a policy respecting them.

JOHN HAY



McKinley's secretary of state ranks as one of the greatest of American diplomats. He was the author of the "open door" policy in China.

The men whom McKinley brought into his Cabinet to direct affairs were practical men who believed that if people were prosperous they would be happy, and that if government protected its own credit and the business of its citizens, they would be prosperous. John Sherman, who had been secretary of the treasury under Hayes, was appointed secretary of state, leaving vacant his seat in the Senate for Hanna, McKinley's friend.

Congress met in early special session to repeal the low Democratic tariff, and to restore high protection in the Dingley Bill (1897). Three years later, in 1900, it took up the stability of the currency, passing the Gold Standard Act, in which it declared that the standard dollar of the United States should be the gold dollar, and that all other forms of money in use should be redeemable in gold on demand. The wave of prosperity now ran so high that the demand for free silver had largely disappeared; because farmers, when they had money, did not want it to be cheap. The low prices of the panic years had begun to yield to higher prices, for even the gold dollar was declining because of a flood of new gold from the Alaska mines. These discoveries, repeating many of the experiences of the California gold boom, caused excitement and a rush to the gold fields, and produced bullion enough to lower the value of gold throughout the world.

#### Rubbing Against the World

McKinley had new problems of another sort because the Spanish-American War left the United States carrying new responsibilities, and dealing in new intimacy with the great powers of Europe and Asia. Some of these powers were deliberately devoting



themselves to a new policy of "imperialism," which meant that each was trying to acquire for itself as much as possible of the backward areas of the world. The United States could not have escaped contacts with it, even had there been no war in 1898; but the war brought it sharply before the American people. (See Spanish-American War.)

McKinley did not wish the war with Spain, but did not see how he could prevent it. When it left the United States in temporary possession of the Spanish colonies, he did not see how the United States could either return them forcibly to Spain, or turn them loose to be seized by eager imperialistic nations. Meanwhile Secretary Sherman, now 75 years old, decided to retire. His assistant, William R. Day, was appointed secretary of state, but held the place only six months, when he became chairman of the United States commission to negotiate peace with Spain. Then President McKinley appointed John Hay, whom he had sent to London a year earlier as ambassador. A better choice could not have been made. Originally a public figure as secretary to President Lincoln, Hay had seen diplomatic service at Paris, Vienna, and Madrid, had been assistant secretary of state for two years in Hayes' administration, had been editor of a great New York newspaper for seven years, and then had retired to work on his monumental book, 'Abraham Lincoln: A History'. During the next seven years he was to prove himself one of the greatest American diplomats.

As soon as the transfer of the Philippines was ratified by the Senate, Secretary Hay took up with the new neighbors, who held possessions in or near China, the question of the status of the Orient. Germany, England, France, and Russia were hopeful of making gains in trade and possessions as China went to pieces. They assented, only with reluctance, to Hay's proposal of an "open door" policy, which proposed that they forego exclusive advantages in China for themselves. In 1900, when revolution in China broke out, and many foreigners were besieged in the foreign quarter of Peking (now Peiping), McKinley sent United States troops with the relief column, and Hay brought pressure upon the other powers not to use this as an excuse for further dismemberment of China. After McKinley died, Hay continued in office, until his own death in 1905, as secretary of state and the recognized leader of Roosevelt's Cabinet.

In Cuba, the pledge of the United States was carried out after the Spanish armies had been taken home. Gen. Leonard Wood, whose great abilities had been revealed during the war with Spain, was appointed military governor of the island, and in 1900 he summoned the people to a constitutional convention to erect a republic. During 1902 the flag of the United States was withdrawn, and Cuba was left to direct her independent affairs, subject only to the "Platt Amendment." This was a declaration adopted by Congress in 1901; it provided that the United States might establish naval bases in Cuba and might

intervene to maintain order, and that Cuba would not create debts which she could not pay out of ordinary revenues, or surrender her independence to any power.

The new interests in the Pacific Ocean, centering in the Philippines, were strengthened by the annexation of the Hawaiian Republic. Formed by revolution in 1893, this republic had immediately sought annexation to the United States. Cleveland had prevented this, believing that the revolution had received improper aid from Americans; but the new McKinley administration quickly brought about annexation by joint resolution of Congress, July 7, 1898.

The war revealed how useful to the United States would be a canal across the Isthmus of Panama. Under the Clayton-Bulwer Treaty, however, Great Britain had equal rights with the United States over any isthmian canal. After lengthy negotiations, which almost failed at one stage because the British government declined to ratify the first draft of the new treaty, Secretary Hay and Lord Pauncefoot, British ambassador to the United States, produced the Hay-Pauncefoot Treaty, which was ratified in December 1901. It specifically abrogated the Clayton-Bulwer Treaty, gave the United States the right to exclusive ownership, permitted fortification of the canal and its approaches, and omitted the former requirement that the canal should be kept open to all nations in time of war as in peace. The treaty also provided that no change in the sovereignty of the territory crossed by the canal should alter the principle of neutrality and of equal rights to enjoy the benefits of the canal.

#### The Tragedy of 1901

Through his first four years, President McKinley continued to grow in popularity. The prosperity of the United States weakened every movement of discontent, and gave strength to his administration. The easy victory over Spain increased the Republican majorities in the congressional elections of 1898. There was no question of McKinley's renomination in 1900, and he was eagerly named at a convention in Philadelphia. With him (for Hobart had died in office), Theodore Roosevelt, governor of New York, was nominated and elected vice-president. The Democrats renominated Bryan to run against them, but the issue that had made Bryan strong in 1896 was weak in 1900. He did what he could to impress on the country the dangers of imperialism, and the ills that would come to the United States if it assumed dominion over foreign peoples. The anti-imperialists opposed expansion of the United States beyond its continental limits as being contrary to the Declaration of Independence and the principles on which the nation was founded. One of the best Republican slogans was "four years more of the full dinner-pail."

The people voted to retain the Republican party and its candidates, and the second term opened smoothly upon a prosperous country. McKinley was broadening his vision as he faced the problems of business and foreign affairs. In September 1901, at the Pan-American Exposition at Buffalo, N. Y., he spoke

of the possible need to consider foreign trade in connection with the tariff, and hinted at a modification of the policy of high protection. Next day, the afternoon of September 6, while he was meeting hundreds of people in a public reception, an anarchist, Leon Czolgosz, approached among the many guests and shot him down. The murder was the whim of a cracked brain, and had no such connection with politics as had the murder of Lincoln by Booth, or Garfield by Guiteau. And eight days later, by the death of McKinley, Theodore Roosevelt became president of the United States.

**MADAGASCAR** (*măd-ă-gās'kār*). About 240 miles off the coast of southeastern Africa lies the island of Madagascar, fourth largest island in the world. Remote from the great centers of civilization, contributing little to world trade, this great island even in modern times has attracted few visitors, except the French who administered it as a colony.

Because many of its animals, plants, and rocks resemble those of Africa, some think that Madagascar was at one time connected to that continent. But it has also plants and animals seemingly of East Indian origin. This is the basis for supposing it to be a remnant of a continent called Lemuria, which is believed to have filled, in ages gone by, the central basin of the Indian Ocean. The natives, called Malagasy, are not related to the Negroes of near-by Africa, but

New Mexico. The island lies almost entirely within the tropics and has rainfall the year round, with a rainy season from October to March. A backbone of mountains stretches the length of Madagascar dropping abruptly on the east to the Indian Ocean and sloping gently on the west to the Mozambique Channel.

## HAULING FREIGHT IN MADAGASCAR



Labor is cheap and plentiful in the great island, so porters do most of the carrying. Though these natives are not particularly strong in appearance, they can carry huge loads great distances over steep trails.

## MALAGASY WOMEN DO MUCH OF THE WORK



These women are wearing the native dress, the lamba. They are weaving mats for their houses from the fibers of the traveler's tree. The leaves of this tree are also used for thatch and for plates and spoons.

seem to be of Malayan, Polynesian, and Melanesian stock. No one knows how or when they first came here.

Madagascar is 980 miles from north to south and has a maximum width of 360 miles. Its area of 228,000 square miles is almost as great as that of Arizona and

The east coast is covered with dense tropical forests. Among the central mountains are large plateaus resembling the savannahs of Africa, with scattered trees and jungles of long grasses. The largest and least known region is the great plain to the west. It is hotter but less moist than the eastern coast, and has both prairies and forests. The southwest coast is flat, sandy, and arid.

Small animal life abounds in all parts of the island. There are no large native mammals and no true monkeys, but Madagascar is the home of the small, monkey-like lemurs (*see* Lemurs). The largest carnivorous animal is the *foussa*, a cat-like relative of the civets, as big as a shepherd dog. Remains are found of a gigantic bird called the *aepyornis* that lived here until two centuries ago. It was over nine feet tall and laid an egg with a capacity of two gallons. It could not fly and resembled the extinct moa of New Zealand, illustrated on page T-19.

The Malagasy live in tribes in scattered villages. The coastal tribes build bamboo houses set on piles. In other places huts are made of dried clay with thatched roofs. Fiber mats are almost the sole article of furniture. The native dress is a loincloth for men and a sort of apron for women, covered over with a square white cloth, called

a *lamba*, which is worn in somewhat the fashion of the ancient Roman toga.

The chief occupation is agriculture. The Malagasy are indolent and like to limit their work to the cultivation of rice, their principal food, and the care of their numerous zebu cattle, originally imported from eastern Asia. But the taxes imposed by the French compel them to labor on plantations where are grown coffee, manioc, vanilla, cloves, and plants that provide essential oils. These, together with dried beans and peas, preserved and frozen meats, hides and skins, are exported chiefly to France. Madagascar's mineral resources are rich, but little exploited.

Lack of good transportation makes commerce within the island difficult. Altogether there are only 500 miles of railways. The principal line runs from Tamatave, the chief seaport, to Tananarive, the capital, situated in the mountains 100 miles from the coast. There are about 16,000 miles of roads, many of them only trails. Few rivers are navigable beyond a short distance from the coast.

Although the Arabs had visited Madagascar since before the 9th century, it was unknown to Europe until the Portuguese discovered it in 1500. French and Dutch followed the Portuguese during the 17th and 18th centuries, but efforts to establish permanent footholds on the island were unsuccessful. By the 19th century, the most civilized tribe on the island, the Hovas, had established their rule over the other tribes and began diplomatic negotiations with foreign nations, chiefly the French and the British. In 1883 the French landed troops and after a series of campaigns and treaties gained complete control in 1896.

In 1942, during the second World War, British forces occupied the island to prevent Axis submarines and raiders from using the big naval station at Diego-Suarez and other ports as bases against the United Nations. Population, 3,800,000.

**MADEIRA** (*mă-dê'ră*). The traveler who approaches the Madeiras, a small group of rocky islands belonging to Portugal, 360 miles off the northwest coast of Africa, gets his most picturesque impression when his steamer enters Funchal, the chief port and capital city of the island which gives its name to the group.

Natives—chiefly of Portuguese descent with some Moorish or negro intermixture—noisy dark-skinned fellows, some wearing the "carapuça," a small blue funnel-shaped cap, surround the vessel. Their small boats are filled with wares such as cane chairs, basket work, red bananas, pineapples, custard apples, pomegranates, and other tropical fruits, and sometimes beautiful lace and embroidery. Others, swarthy and half-naked, plunge from their canoes into the water after the coins tossed them by the passengers. Within the city one sees, among other strange sights, wooden sledges and cars on runners drawn by bullocks, for in the Madeiras wheel-carriages are rare.

Madeira is a rocky island of volcanic origin, 35 miles long and 12 miles wide, with a few scant forests, deep narrow ravines, and lofty rugged peaks (4,000 to 6,000 feet high) often covered with snow. Bold precipices rise abruptly from the coast and in parts the scenery is wild and beautiful. The climate is mild and uniform, and the island is noted as a health resort, especially for persons suffering from diseases of the chest. The absence of rain during the summer and the rocky and hilly nature of the land have made cultivation difficult.

The two staple products are sugar and a wine that is world famous. Vegetables and a variety of fruits are grown—apples, pears, and peaches of poor quality, oranges, lemons, grapes, guavas, figs, bananas, and pineapples, the last two forming articles of export.

Besides the island of Madeira, one other of the group, Porto Santo, is inhabited. The Madeiras are supposed to have been known to the Phoenicians in ancient times and were rediscovered by a Portuguese explorer in 1419 and colonized about 30 years later. Because of their location they played an important part in the early explorations down the west coast of Africa. Madeira is today a port of call for steamers between Europe and South Africa. Area, 314 square miles; population, about 215,000.

## MADISON—"FATHER of the CONSTITUTION"

*The Author of the Famous "Virginia Plan" around which the Framework of the Union was Built—How His Wife, Dolly Madison, Helped to Raise Him to the Presidency—The Shadow of the War of 1812*

**MADISON, JAMES** (1751-1836). When Martha Washington heard of Dorothea Todd's engagement, in 1794, to Congressman Madison, she said, "Dolly, you pretty minx, make this bachelor better known and more popular." Dolly did both. She didn't know as much about books as did her scholarly husband, but she did know how to get him into society, and to win countless friends for him by her kindness and tact. Washington Irving describes her plump beauty as a marked contrast to her husband's small feeble figure and wizened face—for Madison was "a small man, quiet, somewhat precise in manner, pleasant, fond of conversation, with a certain mixture of ease and dignity in his address."

Madison, like Washington, Jefferson, and Monroe, was a Virginian by birth. His father owned the large estate of Montpelier, in the then frontier county of Orange. But though possessed of many acres, the Madison family did not belong to the aristocracy or "first families" of Virginia. The family funds, however, were sufficient to provide a good education for James, the eldest son. When he was 18 years old he entered Princeton University, from which he was graduated in 1771; and he then spent another year there studying Hebrew, the history and government of ancient civilizations, and the principles of law.

At that time he intended to enter the ministry. But politics—a pursuit for which he was eminently

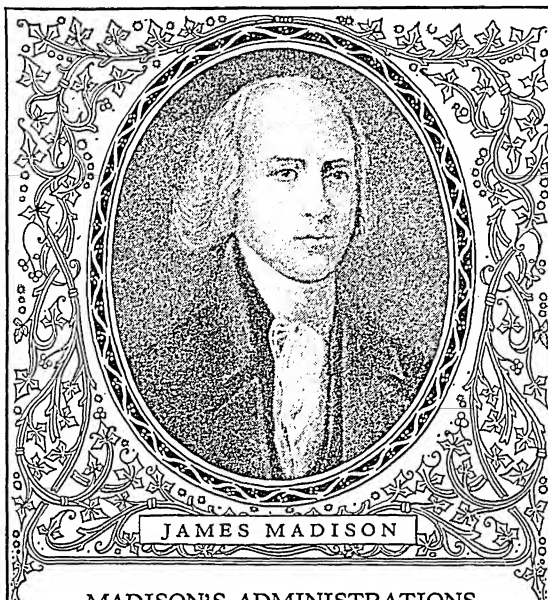
adapted—soon claimed his attention; and from 1776 to 1817, with the exception of about four years, he served continuously in public office. In that time he was a member of the Virginia Assembly, of the Continental Congress, and of the House of Representatives under the new constitution. He had been a member of the convention which framed the constitution of Virginia in 1776, and was one of the leaders in the Constitutional Convention in Philadelphia, in 1787, which framed the Federal Constitution.

Indeed, Madison's chief claim to fame is the work which he rendered in connection with the formation and adoption of that Constitution. He had no sooner entered the Continental Congress, in 1780, than he saw that the national government needed more power. He worked for this both in Congress and in the Virginia assembly, to which he returned in 1784 for a second term; but it was impossible to accomplish anything under the old Articles of Confederation.

When the Philadelphia Convention was called in 1787 to revise the Articles, Madison drew up a plan for a new form of government. This scheme, modified in some details, was introduced into the convention as the "Virginia plan," and on it the new constitution was based. For this work and his other services in that connection, Madison is known as the "Father of the Constitution." In the convention he spoke more frequently than any other member, except Gouverneur Morris and James Wilson. Furthermore, he took careful notes of all proceedings, and this journal, published by order of Congress after the death of all members of the convention, is our most precious source of information concerning the proceedings of that body, which took place in the most profound secrecy.

Madison's work did not stop with the formation of the Constitution. With Alexander Hamilton and John Jay, he wrote a series of essays explaining the new instrument of government and giving reasons

for its adoption. These essays, which appeared first in newspapers and later were published in book form, under the title of 'The Federalist', secured many converts for the Constitution, and remain today one of the best commentaries on the work of the "Fathers" who established the government.



#### MADISON'S ADMINISTRATIONS 1809-1817

Harrison defeats Indians at Tippecanoe (1811).  
Re-charter of United States Bank refused (1811).  
Louisiana admitted (1812); Indiana (1816).  
Continued aggressions of England and France lead to war with England (1812-15).  
Re-election of Madison on war platform (1812).  
Perry's victory on Lake Erie (1813).  
Washington burned by British (1814).  
Jackson crushes Creek Indian uprising (1814); defeats British at New Orleans (1815).  
Treaty of Ghent leaves question of impressment unsettled.  
Hartford Convention (1814) leads to fall of Federalist party.  
Second United States Bank chartered (1816).  
Mildly protective tariff passed (1816).  
Policy of Federal aid to "internal improvements" begun (1816).  
Monroe elected President (1816).

Madison hurried home from the Constitutional Convention to secure election to the Virginia state convention, to which the Constitution would be submitted for ratification. In this convention he vigorously opposed the aged Patrick Henry, who thought that the rights of the people would not be secure under the new form of government. In spite of the strong opposition of the Anti-Federalists, Madison finally triumphed and Virginia ratified the constitution.

But Madison evidently thought that there was some justice in the arguments of the Anti-Federalists, for in the newly organized House of Representatives, which he entered in 1789, he became the leader of Jefferson's party favoring strict construction. In 1798, also, while in retirement, he wrote the famous Virginia Resolutions, adopted by the legislature of that state, which condemned the repressive alien and sedition laws passed by the Federalists, and claimed that a state could "nullify" an act of Congress.

With the accession of Jefferson to the presidency, in 1801, Madison became secretary of state. Since Mrs. Jefferson was dead, it fell to the lot of pretty "Dolly" Madison, his wife, to act as hostess at the president's state dinners. The many friends she won, together with Madison's great ability and purity of character, and Jefferson's support, caused Madison in 1808 to be chosen the fourth president, by an electoral vote of 122, to 47 cast for Charles C. Pinckney, the Federalist candidate. George Clinton of New York, who had served as vice-president in Jefferson's second administration, was re-elected to serve in the same office under Madison.





The work of setting up the government and giving it the needed strength had been successfully accomplished under Washington's administration, and a democratic trend had then been given to it by Jefferson; so Madison did not have to deal with these fundamental problems. But the shadow of war hung over his whole term of office. His first years were occupied with the disputes with England and France, which culminated in 1812 in a declaration of war against England (*see War of 1812*).

Madison, with Elbridge Gerry of Massachusetts as the candidate for vice-president, was reelected in 1812 over De Witt Clinton of New York, the Federalist candidate, by 128 electoral votes to 89.

It must be admitted that Madison's administration of the war was far from efficient. He was hampered both by his own lack of ability as an executive, and by the violent opposition to the war of the New England Federalists, who in December 1814 met in the famous Hartford Convention, which was suspected of planning New England's secession from the Union.

#### The End of the Federalist Party

With the peace of Ghent (Dec. 24, 1814), this opposition collapsed and the charge of disloyalty against the Federalists caused the death of their party. In spite of the fact that there was only one political party and that that party in theory favored strict construction and states' rights, various nationalistic tendencies developed during Madison's administration. These were shown in the new protective tariff law, and in the chartering of the second Bank of the United States, both in 1816.

In 1817 Madison retired to his estate at Montpelier, where his efforts as a planter were no more successful than were those of his friends, Jefferson and Monroe. Like them he was interested in education, and he served with them as regents of the University of Virginia, to which he left his library after his death.

**MADONNA.** The Italian word *Madonna* ("my lady") has become by almost universal usage the name by which we designate Mary, the mother of Jesus. After the 4th century the reverential adoration of the Christ-mother assumed a large part in the minds of the great mass of the common people, for, after the Council of Nicea in 325 had clearly fixed the place of the Son in the Trinity, he seemed less of an intercessor and more one with God himself. What more natural than that his mother, in whom all early Christians might also honor womanhood, should be a refuge to the faithful, who might through her and her intercession approach the Father and the Son with their humble prayers? The church in its beliefs and doctrines could not remain untouched by this, and the Virgin Mary assumed a larger and larger place in daily worship in the succeeding centuries.

So also she naturally became the favorite theme of Christian art from its simple beginnings to its glories in the Renaissance. Such quaint stiff little figures

they painted of her in the early days! Often her arms were extended in prayer, and she always wore a blue robe starred or slashed with gold which was draped over her head. The *Madonna* became much more natural and beautiful when Italian artists in the 13th century broke away from the old Byzantine types. Then Fra Filippo Lippi—discarding even the gold backgrounds that were then so popular—painted some charmingly lifelike pictures of the Mother and Child. Botticelli and Leonardo da Vinci also created some beautiful real *Madonnas*.

All the earthly and heavenly scenes that legend gave them of the life of "my lady" the artists painted—the superficial, unbelieving, and time-serving artists as well as the truly great and sincere. How dreamy, exalted, loving, are these beautiful Mother visions of the greatest masters! Andrea del Sarto's 'Madonna of the Sack', Leonardo da Vinci's 'Madonna of the Rocks', Titian's glorious colorful 'Assumption', Correggio's sweet and tender 'Holy Night', Murillo's vision of the 'Immaculate Conception'—one cannot begin to name the *Madonna* masterpieces of the world's artists. But though striking and beautiful *Madonnas* have been lovingly painted by artists of all lands, there is one painter whose work in this field is supreme. "Oh, their Raphael of the dear *Madonnas*!" sang Browning, thinking of the 50 or more celebrated *Madonnas* painted by the Italian master. Raphael's two most famous paintings are that perfect mother picture 'The *Madonna of the Chair*' (*Madonna della Sedia*) and the glorified painting of the Christ-mother descending from the heights of Heaven, clasping her thoughtful little Son. In her eyes are the conscious wonder and reverence of one who beholds afar His destiny as Savior, while below St. Sixtus and St. Barbara kneel in adoration—the world's favorite 'Sistine *Madonna*'. It is set apart in a room by itself in the gallery at Dresden.

In sculpture, too, the *Madonna* has been glorified, the finest examples perhaps being Michelangelo's 'Madonna of Bruges' in the Bruges Cathedral, and his poignant and very lovely 'Pietà' of St. Peter's.

**MADRAS** (*mă-drās*), INDIA. A flat country prickly with cactus, and drab, pyramid-like temples, a land of red and black—black cattle straggling along red roads, swarming little black people in red loin-cloths, bearing the red triangle of the god Vishnu on their foreheads—such is the presidency of Madras in southeast India.

Madras is India as you have always pictured it, the India of toddy palms, rice-stalks standing in water, and gaunt natives naked above the loins, sharp-featured and quick-eyed with heads close-cropped before and streaming with ragged locks behind.

The capital of the presidency and its chief seaport is the city of Madras, the third city of India, founded by the British nearly 300 years ago. It spreads back from the breaker-tossed shore for miles and miles into the country, a city of suburbs; each house set in the midst of a walled yard, called a "compound," that is almost a park in attractiveness.

## THE WORLD-FAMOUS 'MADONNA OF THE CHAIR'



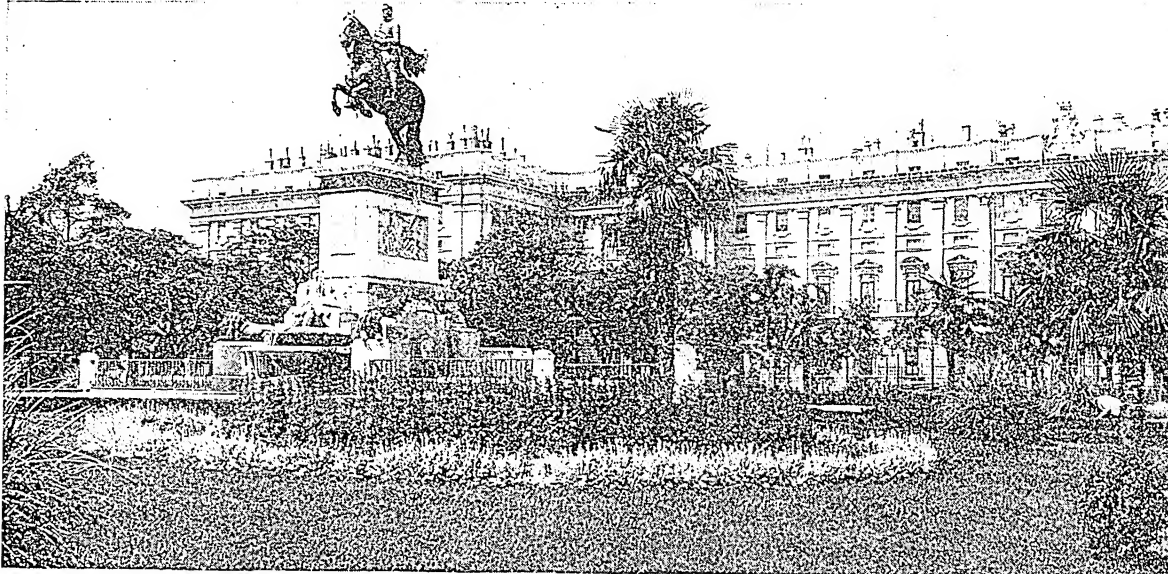
Raphael's masterpiece, now hanging in the Pitti Gallery in Florence, owes its origin to a curious incident. For years Raphael had searched for a fitting model, but did not find her, until one day he encountered a peasant woman seated and holding a boy in her lap, while another stood nearby. She was exactly the type he had been seeking. Raphael had a pencil, but nothing else, so he seized a smooth barrel head and made his sketch upon its round surface. From this sketch he worked out what has since been called "the most popular painting ever made."

From the top of the lighthouse you can look down on the red huddled roofs of George Town, the business section, which borders the large artificial harbor. To the south lie old Fort St. George, the original settlement, and a number of imposing public buildings. Along the sandy beach runs the Marina, a fashionable drive. Here in the late afternoon the British resi-

and redwood. The 19,000 square miles of timber lands are under state control. Manganese is mined, but other rich mineral resources are not developed.

The cotton cloth called madras was first made in a village near Madras. In this region there are cotton and rice mills, railway shops, sugar refineries, brick works, tanneries, and a government quinine factory.

#### WHERE SPANISH KINGS AND QUEENS ONCE LIVED



This is the eastern side of the royal palace, which after the fall of the monarchy became a museum. It looks out upon the Plaza del Oriente and the equestrian statue of Philip IV. The palace, of white granite, was begun under Philip V in 1737 and was finished in 1764. It stands on a height on the west side of Madrid. Adjoining it is the Armory, with one of the world's finest collections of armor.

dents and wealthy Indians enjoy "the doctor," the sea breeze that makes life bearable in the evening along this tropical coast. Still farther south is St. Thomé, an old Portuguese settlement.

With Madras University, the Presidency College, several missionary schools, and special schools of arts and professions, Madras is educationally the first city of India. Its port handles nearly half the sea-borne commerce of the presidency. Population, 650,000.

Madras Presidency, 142,260 square miles, is the largest province of British India. Within its boundaries lie a number of Indian states. Although it has a coast line of about 1,250 miles on the Bay of Bengal and 450 miles on the Arabian Sea, Madras has no good natural harbors. The harbor of Cochin, the second port in volume of trade, like the 200-acre harbor of Madras, has been dredged from shallow waters.

The rainfall varies from about 150 inches a year on the narrow west coast to only 20 inches in some regions east of the Western Ghats. On the broad eastern coast three fertile river deltas are irrigated to supply about one-fourth of the cultivated land. The Mettur-Cauvery Dam on the Cauvery River irrigation system is one of the largest in the world. Seventy per cent of the people work on the land. Rice, millet, oilseeds, cotton, sugar cane, tea, coffee, and ground nuts (peanuts) are the chief crops. Valuable forest woods include teak, ebony, rosewood, sandalwood,

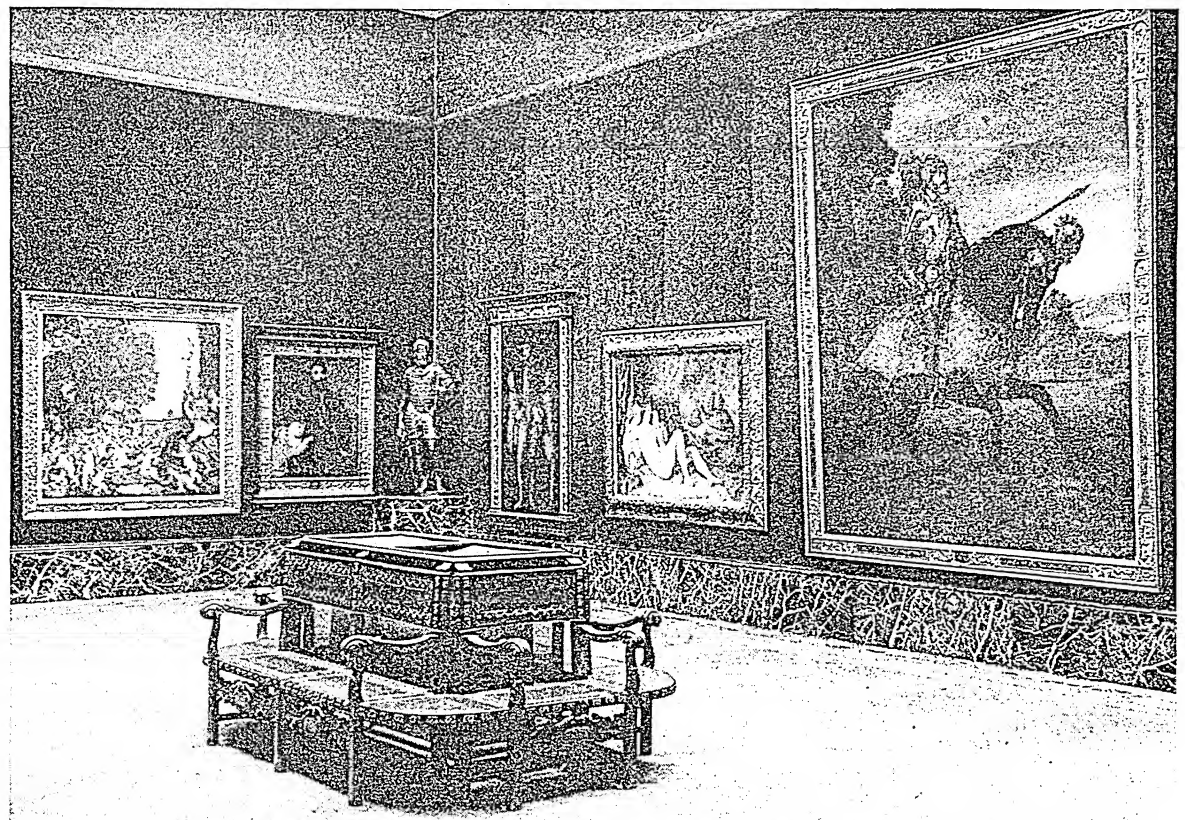
Population of the presidency, 46,735,000, of whom about 88 per cent are Hindus. (See also India.)

**MADRID, SPAIN.** When Philip II made Madrid his capital and "only court," in 1560, it was a town of slight importance. He chose it chiefly because of its central position and perhaps also because his father Charles V had found its bracing climate healthful. Foreign visitors, however, coming from the pleasant south of Spain, may be tempted to think that "the king who never smiled" chose it mainly for its dreariness. For it lies on a plateau more than 2,000 feet above the sea, unprotected from the sun in summer or the icy winds that blow from snow-clad peaks in winter, and it is without countryside and without suburbs. Philip's summer palace, the Escorial, 27 miles away, would probably confirm their opinion. This palace, as its name indicates, stands on the "cinders" of an old iron mine. It is a monastery, a church, and the burying place of the Spanish kings as well as a palace. It was built in honor of St. Lawrence. The shape is symbolic of the gridiron upon which the saint suffered martyrdom: the courts represent the interstices of the bars; the towers at the corners, the legs; and the palace itself, the handle.

Madrid, it is believed, dates from Roman times. Although it was a Moorish outpost in the late 10th century and was flourishing at the time Philip made it his capital, it does not have the historic pictur-



# FAMOUS ROOMS IN MADRID'S PRADO MUSEUM



In the Prado National Museum at Madrid, Spain assembled one of the world's finest art collections. The gallery above is devoted to masterpieces by Titian. From left to right: 'The Garden of Loves'; portrait of Alphonso d'Este, duke of Ferrara (with a bronze statue of the duke beside it); portrait of Charles V in 1531; 'Danaë'; and 'Charles V at the Battle of Mühlberg'.



In this gallery are some of the most famous of Velasquez' paintings. From left to right, we see: 'The Maids of Honor'; 'Menippus'; portrait in boy's hunting dress of Don Balthasar Carlos, son of Philip IV; 'Aesop'; Philip IV as a huntsman; portrait of Mariana of Austria, second wife of Philip IV; portrait of Don Fernando, the king's brother; and 'The Surrender of Breda'.

esqueness of Spanish cities which the Moors helped to build. It appears modern, with many well-built houses and public buildings, wide streets and boulevards, office buildings in American style, and fine bridges over the meager trickle of the Manzanares.

The city centers about the plaza where the Gate of the Sun, or *Puerto del Sol*, stood in medieval days; from here radiate ten important streets and many trolley lines. Madrid has beautiful old churches and fine parks; *Buen Retiro* is perhaps the loveliest of the parks.

In modern times Madrid, with its world-famous university, became the leading educational center of Spain; its prestige was enhanced by University City, a vast educational project sponsored by Alfonso XIII. This center was wrecked in the civil war of 1936-39. During the siege of the city, which lasted more than two years, thousands of buildings were destroyed. The art treasures of the Prado Museum were removed early in the war to save them.

Madrid is the natural railway and aviation center of Spain. Its industries grew steadily after 1890 until the civil war. Leather, tobacco, chocolate, chemicals, porcelain, pottery, fans, furniture, and rugs are the chief products. Population, about 950,000.

**MAETERLINCK** (*mă'tēr-līnk*), COUNT MAURICE (born 1862). About the beginning of the 20th century, Maurice Maeterlinck, a Belgian writer, attracted world-wide attention. Some critics hailed his work as founding a new era in writing; others called it foggy nonsense; but no literary person ignored him.

The incidents in Maeterlinck's writings were fanciful and dreamlike; his characters were pale, almost ghostlike. But the reader felt that he was seeing the soul, rather than the outward shell of flesh and blood. The whole effect was to send the reader's thoughts wandering freely through a world of fancy.

Such mystical writing might not have been so widely popular, had not a French critic, Octave Mirbeau, suggested that Maeterlinck's first play was "superior in beauty to whatever is most beautiful in Shakespeare." This remark immediately gave Maeterlinck fame as "the Belgian Shakespeare."

Maeterlinck's mysticism is partly explained by his early life. He was born in Ghent, Belgium, Aug. 29, 1862, the son of a well-to-do lawyer; no poverty disturbed his naturally dreamy turn of mind. His mystical tendency was strengthened in 1887, when he lived in Paris and met many French symbolist poets—men who tried to arouse feelings and emotions with words as a musician does with sounds.

Maeterlinck was educated for the law but he did not like it; and soon after his father died, he turned to writing. His first works appeared in 1889. One was a group of poems called 'Serres chaudes' (Hothouses); the other was the play, 'Princess Maleine', which Mirbeau praised so highly. In these and other early works, Maeterlinck showed a somber belief that people

are moved by fate, like marionettes in a puppet show. Hence some critics call his early characters lifeless puppets. This phase of his writing reached its climax in the play 'Pelléas and Mélisande'. The two lovers in this play were too shadowy for successful portrayal on the stage, but became favorites in an opera by Debussy (see Opera).

#### 'The Blue Bird'

After this play, Maeterlinck developed a happier mood which resulted, among other works, in his charming play, 'The Blue Bird'. A woodcutter's children, Mytyl and Tytyl, want a blue bird. The fairy Berylune gives them a magic diamond, and they start searching.

They meet the souls of Fire, Light, and many foods; they visit the realms of Memory, of Night, and of the Future. But no blue bird can be found. At length they return home, and a neighbor asks Tytyl if he will lend his pet dove

to comfort a sick child. Tytyl does this, and the dove becomes a blue bird. As the play ends, we realize that the Blue Bird is Happiness, and that happiness is best found at home, through acts of kindness. Though it seems simple, the play is full of hidden meaning.

#### Other Writings and Later Life

In addition to plays and poems, Maeterlinck wrote many essays, more or less mystic in character and poetic in expression. Among the best known are 'The Treasure of the Humble' and 'The Life of the Bee'.

Maeterlinck's writings made him rich, and he bought an old Norman abbey near Rouen for a home. His first wife was the actress Georgette Leblanc, who appeared in many of his plays. After a divorce, he remarried and lived near Nice. He was awarded the Nobel prize for literature in 1911, and was made a Count of Belgium in 1932. Unlike many modern Belgian authors, who write in Flemish, he always wrote in French.

His chief plays are: 'La Princesse Maleine' (1889); 'Les Aveugles' (The Blind), 1890; 'Les sept princesses' (The Seven Princesses), 1891; 'Pelléas et Mélisande' (1892); 'Soeur Béatrice' (Sister Beatrice), 1899; 'Monna Vanna' (1902); 'L'Oiseau bleu' (The Blue Bird), 1909; 'Le Bourgmestre de Stilemonde' (The Burgomaster of Stilemonde), 1918. Among his other works are: 'Serres chaudes' (Hothouses), 1889; 'Le Trésor des humbles' (The Treasure of the Humble), 1896; 'La Vie des abeilles' (The Life of the Bee), 1901; and 'Le double jardin' (The Double Garden), 1904; 'La Mort' (Death), 1913.

#### BELGIAN MYSTIC



Maeterlinck grew up with "the heavy squareness of the Flemish peasant," but always had a spiritual and extraordinarily sensitive face. In later life he was very gray, and clean-shaven. The glance of his eyes has been described as "blue and brief."



**MAGAZINES.** The high-school boy who stops at the newsstand to buy a copy of his favorite magazine does not realize what he is getting for his nickel or dime. He sees the brilliant colors of the covers, huge piles of hundreds of magazines, alluring titles, clever pictures, attractive posters. He picks out what he wants and goes home for "a good read."

But at the newsstand he has touched for a moment the current of thought of the whole world. His magazine will change his ideas and his interests the moment he opens the covers, for, as he goes home to read, he takes the world with him.

Millions of other Americans, the largest reading public in the world, are also going home to read. Happenings of the day will reach them through the newspapers. The more permanent aspects of modern life and culture—new facts, comment on the news, controversy, debate, new ideas, thrilling stories, beautiful poems—come to them through the magazines.

## How Magazines Differ from Newspapers

Magazines differ from newspapers in several ways. Magazines are usually published weekly or monthly; most newspapers are published daily or in several editions every day. Magazines deal with every subject under the sun; newspapers confine themselves mainly to the happenings of the day. Magazine articles have short titles; newspapers have elaborate headlines which are really "compressed sentences." Magazines are printed on fairly good paper, in small sizes, with

specially designed covers; newspapers are printed on large sheets of very cheap paper, and American newspapers never have covers but plunge into the news on the first page.

Since the early 1920's, a new type of "news magazine" (half newspaper and half magazine) has developed in America and been imitated in England. This is not really so new as it seems, however, for it is a return to the little *Weekly News* published in London in 1622. Reprint magazines, which condense articles from other magazines, have also become popular. They, too, are a return to old-fashioned publishing. A hundred years ago, nearly all American magazines were of this sort, finding most of their material abroad. English reprint magazines were even older.

Supported by Advertising

Most magazines are business enterprises, run for profit, which they make by selling space to advertisers. Every copy may cost a great deal more to print and deliver than the subscriber pays for it; but if the magazine can win enough readers, advertisers are glad to pay high prices for advertising space. This makes up the loss and adds a profit.

Magazines are usually classified as "class," "mass," and "quality." *Class* magazines are those which appeal to a special group or class. Thus, a journal devoted to the drug trade will be read by druggists, a medical journal by doctors, a sporting magazine by sportsmen, and so on. Advertisers use such magazines when they



want special audiences for special merchandise. No advertising in them runs the chance of being wasted on uninterested readers. (*See Advertising.*)

Magazines for boys and girls are class magazines. They appeal to a special age group. Advertisers know that young people will respond to advertisements of athletic equipment, clothing, games, insignia, and camp fixtures. They have also discovered that young people often influence their parents in family purchasing. That is why these magazines often advertise articles intended for the whole family.

Mass magazines are edited to appeal to everybody, young or old, no matter what his education or profession. They are valuable to advertisers who want to sell to everybody. Automobiles, radios, toilet articles, food, cosmetics, furniture are all called to the attention of the public in this way. Mass magazines with circulations of from half a million to three millions are so valuable to advertisers that they gladly pay several thousand dollars a page. They know they are getting their money's worth, because advertisements in a few such magazines will bring their wares to the attention of the whole nation.

Quality magazines are expensive and appeal to a group of readers limited in number but highly educated. Insurance companies, reliable stock and bond houses, and makers of pianos, high-grade furniture, and expensive automobiles advertise in them freely. The quality magazines almost monopolize book advertising, because their readers are booklovers.

#### The Riches Between the Covers of a Magazine

We get both recreation and education from magazines. A few issues of a good magazine often give us one or more serial novels, in addition to articles, poems, short stories, and special departments. Magazine articles stand midway between newspapers and books—they are more carefully prepared than the hasty reports of newspaper writers, and they have a timeliness lacking in the maturer expressions of authors of books, which may be out of date before they can be published.

Years after publication, when they have been bound and put away on library shelves, magazines are still valuable as a permanent record of life, thought, and culture. They are storehouses of information, as the word implies, for "magazine" comes from an Arabic word meaning storehouse. They are a valuable source of material (often by the best authorities) for student themes and essays on every possible subject. In this immense mass of material, students can quickly find the exact articles they want by using three reference works—"The Readers' Guide to Periodical Literature", "The International Index to Periodicals", and "The Industrial Arts Index". These useful catalogs classify by author, title, and subject nearly every important magazine article published in the English language.

#### Relation to Public Opinion

Editors of magazines both follow and guide American life and opinion. An editor's main work consists in studying the taste of his public. By adjusting

his magazine's contents to that taste he can keep his readers and make his magazine a success. Many student editors of school and college magazines forget this. Their magazines fail because they print what they themselves enjoy without considering what the school public wants to read.

But magazines may also lead their readers, instead of merely following them. Magazine campaigns have done much to end the sale of fraudulent patent medicines, improve architecture, promote good taste in interior decoration, "clean up" unsightly landscapes, clarify political issues, destroy corruption, popularize science, and in general guide the public mind.

#### How Articles Are Obtained

Would-be contributors flood magazine editors with enormous numbers of manuscripts. Even rather small magazines may receive from ten to forty thousand manuscripts a year. Perhaps two per cent are accepted. Most magazine articles are thought out by the editor, who then looks about for an author to carry out his idea. Student editors might improve their magazines by doing the same thing—thinking up some ideas of interest to their schools, and then finding suitable writers among their fellow students.

Beginning authors are sometimes paid nothing at all by the unimportant magazines that print their work. More frequently, they are paid \$10 or \$15 an article. Quality magazines pay from \$50 to \$500. The big mass magazines pay from \$500 up to \$2,000 or more. Successful fiction writers can command \$1,000 or more for a short story and \$20,000 or \$30,000 for a serial novel. Often they later get large additional payments for motion-picture rights.

#### How American and European Magazines Differ

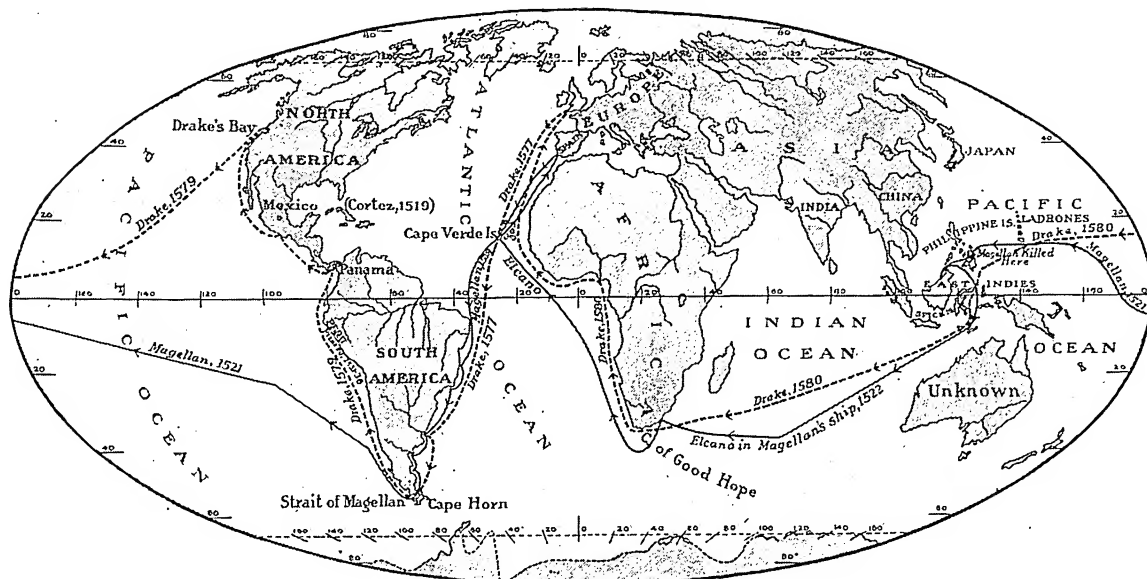
American magazines differ widely from those abroad. One main reason for the difference is their immense market. Including Canada, where they are just as popular as they are at home, American magazines can count on a reading public twice as large as that open to British magazines. Hence, American magazines have more money to spend. They can afford the finest typography and illustrations, and they can attract European and American writers of the highest talent. Magazines in Europe and Asia have less advertising and fewer readers. One handicap is the lack of a common language. They are further hampered by government censorship.

#### The First Magazines

Like newspapers, magazines are a late development in the history of literature. Newspaper and magazine publishing was impossible until printing had been invented, until there could be distribution by a modern postal system, and until there was a large reading public. Until the middle of the 19th century, only the wealthier people were educated and the reading public was small. And so magazines were not numerous, and their circulations were limited.

As early as Queen Elizabeth's time, publishers had experimented with books that had a number of articles dealing with a variety of subjects. These books were

## THE FIRST VOYAGES AROUND THE WORLD



This map shows two of the greatest feats in the history of exploration, the voyage around the world by Magellan's expedition in 1519-1522, and the second circumnavigation of the globe, by Drake, half a century later. Magellan did not live to complete the voyage, for he was killed in a fight with the natives on one of the Philippine Islands. Out of the five vessels with which he set out, only one, the *Vittoria*, under Juan Sebastian del Cano, survived to accomplish the full voyage around the world.

like magazines with only one issue. It did not occur to their publishers to keep on bringing them out month after month. By 1699, however, one of the earliest magazines, *The History of the Works of the Learned*, a book review, had been established. During the 18th century numerous English magazines came into existence, such as *The Tatler* and *The Spectator* (see Addison, Joseph).

The English colonies in America soon began to imitate the publishers in the mother country. Benjamin Franklin was the first to plan an American magazine, but he was anticipated by Andrew Bradford, who started his *American Magazine* in 1741. Franklin followed with his *General Magazine and Historical Chronicle* in the same year. The reading public of the colonies was too small, however, and neither magazine lasted out the year. Few of the early magazines had more than 1,500 readers, or lasted very long.

Magazine publishing was a perilous business then and has always remained so. On the average, more than 300 magazines cease publication in the United States every year. Nevertheless, the total number averages between 5,000 and 6,000, as compared with about 13,000 newspapers. Some American magazines have had long lives. *The Saturday Evening Post* claims descent from Benjamin Franklin's *Pennsylvania Gazette*. *The Living Age* has been published steadily since 1844, *Harper's* since 1850, *The Atlantic* since 1857, *Popular Science Monthly* since 1872, and *The Forum* since 1883. (See also Newspapers.)

The best account of magazines in the United States is 'A History of American Magazines', by F. L. Mott. There is good material in 'The Cambridge History of American Literature'. The problems and methods of publishing magazines are discussed in 'Magazine Making', by J. Bakeless.

MAGEL'AN, FERDINAND (FERNÃO DE MAGALHÃES) (1480?-1521). "The ocean! The great western ocean!" shouted the Spanish seamen, as their cannon saluted the mighty Pacific which they had been seeking for many weary months. "If we live we shall yet find the new way to the Islands of Spices!"

"Thank God our Lord!" exclaimed Magellan, their captain. "It is true, Señores, that we have lost two vessels, that our provisions are wasted, and that we may have many more hardships yet to endure. But even if we are reduced to eating the leather on our ships' yards, we will go on!"

This is the dauntless spirit shown by that Portuguese mariner who discovered the Strait of Magellan, and who was not only the first European to sail across the Pacific Ocean, but also the first to discover a route over which ships could sail a complete circle around the world.

Magellan, the son of a Portuguese nobleman, early served in the Indies and Morocco with distinction. Believing his king had not justly rewarded his services, he renounced his nationality and offered to serve Charles V of Spain. At the time, Portugal claimed that all the islands of the Far East lay in the portion of the earth assigned to Portugal by Pope Alexander VI (see America). Magellan asserted that many of them, including the fabulously rich Spice Islands, or Moluccas, actually lay in Spain's territory, and that the Portuguese maps had been falsified to conceal this. He offered to use his knowledge of Portuguese secrets to prove his assertion, and proposed to reach the Spice Islands by sailing west through a strait which he hoped to discover at the southern tip of America. The Spanish king



finally accepted Magellan's proposal, and on Aug. 10, 1519, the latter set sail from Seville in command of five small vessels. Across the Atlantic and down the coast of South America he sailed until very cold and stormy weather forced him to seek winter quarters. A mutiny was put down by force.

Sailing on again in the spring (which came in September in the Southern Hemisphere), Magellan's fleet rounded a promontory and on October 21 sighted what he guessed to be the sought-for strait. Two ships went ahead and reported that the strait led to an ocean beyond; so the fleet proceeded. The "ocean" proved to be only a large bay in the strait; but at a council held with his navigators Magellan declared his purpose of going on.

For over a month he battled his way through this stormy 360-mile passage. One vessel was wrecked and another stole away and sailed back to Spain; but still Magellan persevered. On Nov. 28, 1520, he reached the ocean that Balboa discovered seven years before, and which Magellan now—because it looked so calm—named the Pacific.

At first the voyage on the Pacific went well, save for monotony. One of the sources of amusement was a Patagonian, whom Magellan had kidnapped with the idea of exhibiting him in Spain; and the chronicler of the voyage, an Italian named Antonio Pigafetta, even made progress in setting down the Patagonian language.

But after a month of sailing, terrible hardships assailed the fleet. The provisions ran low, and rats and leather were choice foods. The drinking water turned thick and yellow, and dozens died of scurvy.

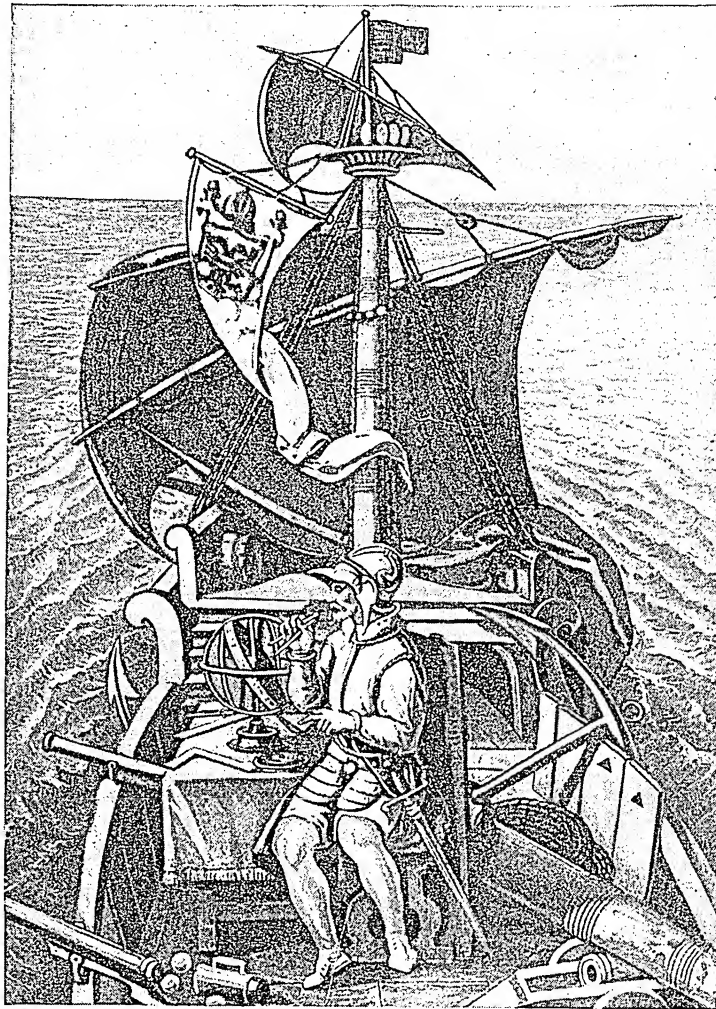
In all, the fleet sailed 93 days before discovering Guam of the Marianas, and a week later the Philippines. He established friendly relations with the treacherous King of Cebu who professed Christianity

in order to win the help of Magellan. The great navigator, who was induced to undertake an expedition to conquer the neighboring island of Mactan for the Catholic faith and the King of Cebu, was killed in a fight with the natives, April 27, 1521. The King of Cebu afterwards got into his power several of the explorer's most prominent men and murdered them. The survivors burned one of the three remaining vessels and sailed to the Moluccas, or Spice Islands. Another vessel, becoming leaky, had to be abandoned.

The last remaining vessel, laden with spices, at last rounded the Cape of Good Hope and in melancholy triumph dropped anchor in the harbor of Seville, Sept. 9, 1522. It

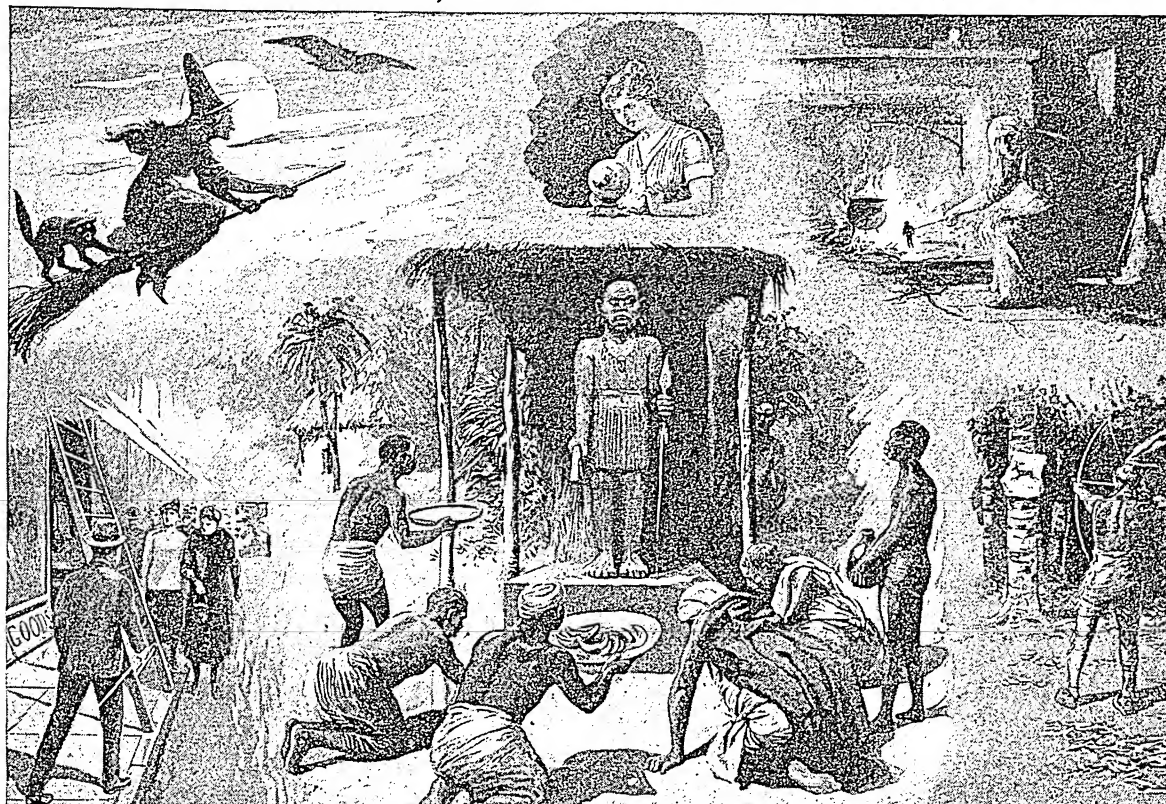
had circumnavigated the globe, but so too had the dead commander, for on a previous expedition he had gone eastward to 130 degrees, and when he fell he was in 124 degrees east longitude. In the history of discovery no name ranks higher than that of Magellan. He had done what Columbus set out to do—he had sailed westward to the Spice Islands, giving practical proof that the earth is round, and that it is possible to reach the east by sailing west. He opened the Pacific Ocean to the civilized world. John Fiske, the American historian, says: "The voyage thus ended was doubtless the greatest feat of navigation that has ever been performed, and nothing can be imagined that would surpass it except a journey to some other planet."

AN OLD PORTRAIT OF MAGELLAN



This drawing of the great navigator was made by a man of his own time. It shows him working with the quaint nautical instruments of the period, but the artist used his fancy freely in drawing the ship.

# CHARMS, SPELLS, and MAGIC INCANTATIONS



**M**AGIC. In primitive days, before science had provided its key to nature, men were surrounded by terrifying mysteries. They could fight their human enemies and overcome wild beasts, but the lightning which killed without warning, the strange diseases which struck men down at their own firesides, the swarms of locusts which devoured their grain, all such unusual disasters appeared to them monstrous and unjust—the products of magic.

The difference between magic and religion seems to have been clear even in those days. The general tendency was to believe that their gods ruled in an orderly manner, each looking after his own department and his own people, with perhaps a supreme god over the entire group. The spirits of magic, however, were considered irresponsible and disorderly. They caused accidents and trouble without reason. But the most important thing about them,

*EVERY child knows wonderful stories of magic. Life would be dull indeed, if elves and fairies, giants and dwarfs, ogres and dragons were done away with. How should we see the beauties of Bagdad without the magic carpet, or the glitter of the robbers' cave without Ali Baba's "open sesame"? What would become of Aladdin without his wonderful lamp, or of Jack without his beanstalk? What a gap would be left in King Arthur's court if Merlin, the great magician, were removed! As long as children glory in wonderful heroes and beautiful princesses, in little boys who conquer monsters and little girls who overcome wicked witches, we shall have seven-league boots, magic swords, wishing cups, purses of Fortunatus, mice turned into horses, and all the marvelous feats of fairyland. The literature of all races has been filled with tales of magic, from the 'Arabian Nights' to 'Peter Pan'. But these are fancies to delight a fireside evening. There is an entirely different side to magic, which has played an important part in nearly all pagan religions and which is dealt with in this article.*

according to savage belief, was that they could be brought under man's control and used for private purposes.

It is this belief, existing down through the ages, which created the thousands upon thousands of magic practices and superstitions, sometimes secret, sometimes carried on in public, but all with the idea of getting supernatural help against enemies or against the powers of nature. The spirits of magic, instead of being looked upon as

gods, were often used to outwit divine authority.

Among the earliest forms of magic are those which rest upon the belief that the fate of an individual may be influenced by getting possession of something which once belonged to him. A lock of hair, nail clippings, a drop of blood might put the person from whom they came completely in the hands of the magician. This is still believed among the natives of the Pacific islands, among the Patagonians of South

America, and even in certain peasant districts of Germany. A bit of clothing stolen from an enemy was also considered a powerful agent of magic. The belief spread to include almost everything which had come in close contact with a man's body, so Australian savages drove sharp stones into a man's footprints to make him go lame.

On the other hand, the weapons or clothing of a man noted for courage may make a hero of the one who seizes them. The claws of a lion will bring the wearer the boldness of the king of beasts, the feathers of the eagle will give swiftness and keenness of eye. These beliefs even affect the food of the savages. Thus the flesh of deer or rabbit may create cowardice, but the meat of the lion, the tiger, the bull, give strength. Cannibalism in part was the outgrowth of such superstition.

Later came the belief that, by imitating the thing or person that he desired to influence, the magician could establish his control. Pretended "rain-makers"

almost always sprinkled water, made smoke clouds, used flashes of fire to indicate lightning and wooden clappers to imitate thunder. Stones shaped like vegetables were buried in the soil to make real plants grow. American Indians drew the picture of an antelope on a piece of bark and shot at it with an arrow. If they struck the drawing, it meant that they would be lucky in their hunting.

It was the custom among many peoples to make figures of wax or clay, resembling the persons they wished to injure. Calling them by name, the magicians would thrust pins into the figures, or tear off an arm or leg, or melt them in fire or water; whereupon illness and death accompanied by great pain was supposed to come upon the person indicated. This practice prevailed in Ireland and England for many centuries. It exists also in the *voodoo* rites of certain negro groups in the Southern States today, being inherited from ancient African beliefs. It is from such rites that we get the word "hoodoo."

The power of names forms a branch of almost all magic. The name was considered as part of a man and, by pronouncing it under proper circumstances, he could be influenced for good or bad. From this belief grew the custom among many savage tribes of having two names for each individual—a real name, which was kept a careful secret, and an everyday title, through which he could not be influenced magically. Gods and spirits were believed to have

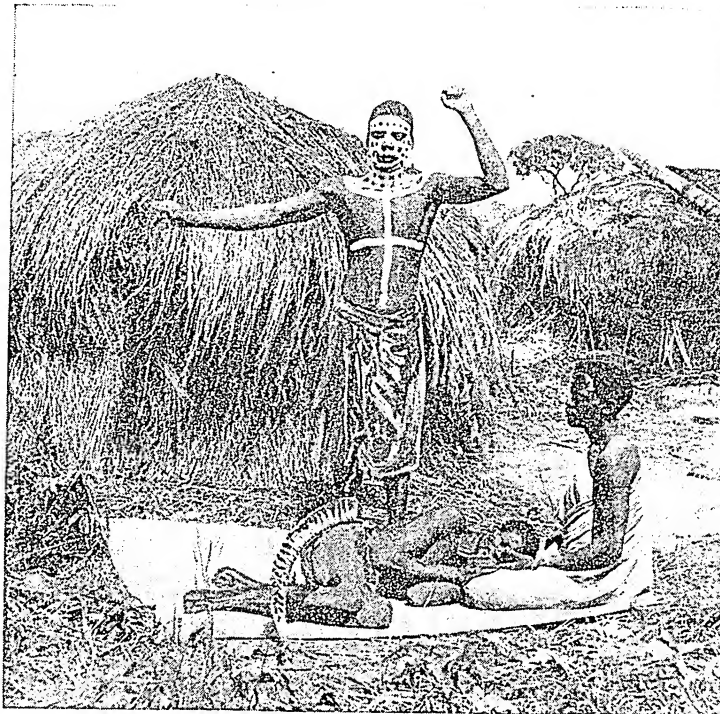
special magic names, known only to a chosen few. Uttering these names was supposed to give a man some power over these supernatural beings. In this way grew up the spells and charms which form so large a part in the history of magic.

Charm-words or certain secret sentences called incantations were used for summoning the spirits of the dead, and all the various jinns and genii, goblins and fairies, who would then obey the orders of the one who possessed the secret. The belief in "putting spells on" hated rivals or other

enemies existed in all countries and continues among the uneducated today. The theory of the curse is part of such a belief. Certain spells like the Irish *geasa* compelled the person addressed to carry out any reasonable task which might be demanded, under penalty of losing honor and reputation. Other spells, like the *tabu* of the Pacific islands, prohibited certain actions. A dwelling might be *tabu*, which would forbid anyone entering it under threat of magic punishment. Various animals or fish, fruits and vegetables might become *tabu* for certain members of a tribe and not for others. This *tabu* power was often used by native chiefs and priests in place of laws, and it was held in such terror that violations were exceedingly rare.

The word "charm" is also used to describe talismans, amulets, mascots, and any object which is carried to bring good luck. Almost anything may become a charm in this sense. Usually the person discovers the magic properties of the object himself,

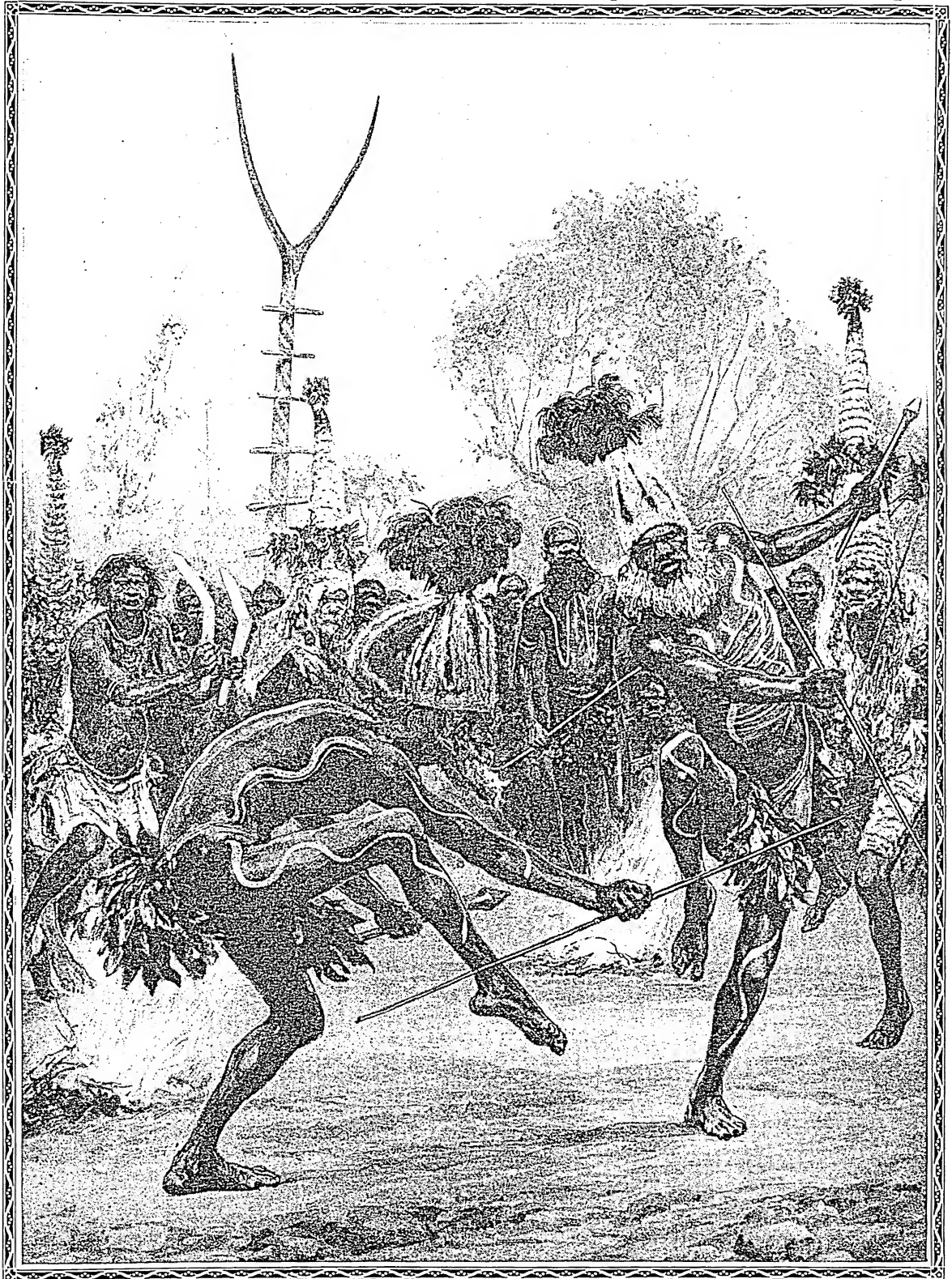
#### MAGIC RITES TO CURE ILLNESS



The sick man is lying down with his head in a relative's lap. The "medicine" is in the curved hollow horn lying over the patient's body, and the "witch doctor" is performing incantations to drive away the demons which the natives believe to be the cause of the trouble.



## THE WILD DANCERS OF QUEENSLAND



These grotesque and terrifying figures are "blackfellows" of Queensland. They are engaged in the "Dance of the Forked Stick," which is supposed to bring anything the tribe desires greatly, from rain to victory over enemies. During such ceremonies it is not unusual for the dancers to become so frenzied with excitement that they thrust their feet into the fire apparently without feeling it. At other times they fall rigid to the ground, and lie unconscious for hours.

and while it may be a charm for him, it is often supposed to bring bad luck to any other person. The most general use of talismans and amulets is to guard against the "evil eye," the fear of which exists in one form or another in almost all parts of the world. Certain persons are believed to have this evil eye and to bring disaster to anything they gaze at, unless proper magic protection is provided.

When a charm is believed to be not merely an instrument of magic but the actual dwelling place of a certain spirit, it is called a "fetish." The worship of fetishes is usually regarded as a form of religion, but it has many of the characteristics of ordinary magic. Fetishism plays a large part in the voodoo practices mentioned above.

While most forms of magic are based on the belief that evil spirits are particularly numerous and likely to injure mankind, there arises also a belief in good spirits. Along these lines, the practice of magic came to be divided into black magic and white magic; the former being used to do harm, the latter to combat this harm and do good instead.

The special magician or sorcerer has existed wherever a belief in magic prevailed. Under the name of necromancers, wizards, witches, conjurers, medicine-men, soothsayers, diviners, and a hundred other titles, they posed as persons who had unusual powers over the spirit world, could foretell the future or read the secrets of the past. They were everywhere regarded by the people with fearful respect. In Christian countries persons suspected of dealing with the powers of evil were persecuted severely (see Witchcraft). But many of their practices were regarded as beneficial, even in Europe, in the Middle Ages and later. Studies in magic frequently led to important

scientific discoveries, for the sorcerers in contriving their magic philters and other drugs made wide researches in chemistry, while those who studied the

influence of the stars on human life learned many a valuable fact about astronomy.

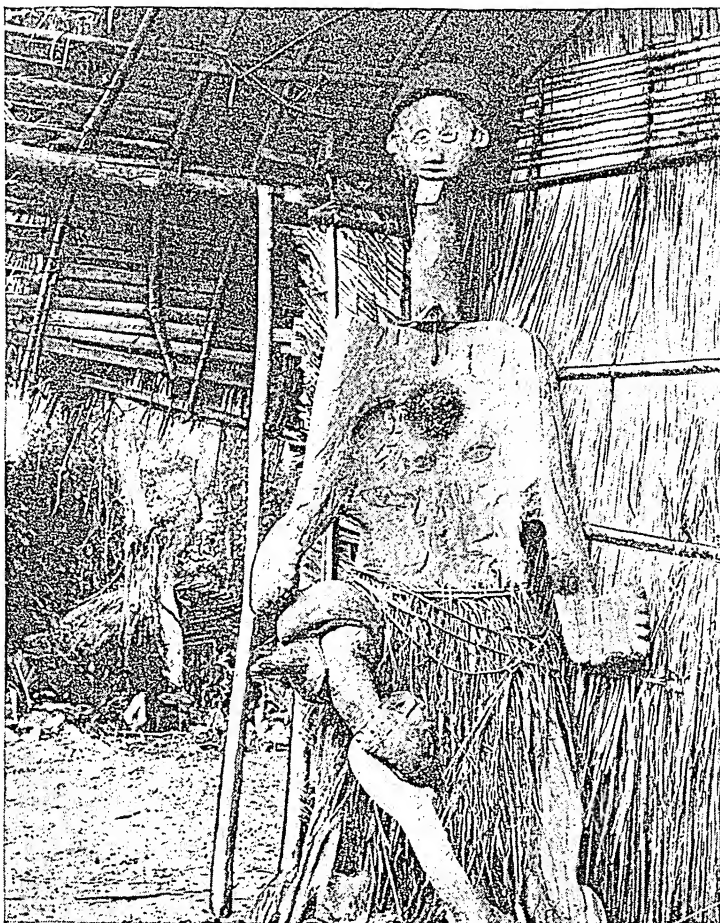
In common practice, however, their so-called skill was directed toward interpreting dreams, getting information about the future from their "familiar" spirits, and, in almost all cases, deceiving a superstitious public for their own personal profit. Among the intelligent, their fraud was usually suspected, and it was the Roman Cato who "wondered how one diviner could meet another on the street without laughing."

While modern man prides himself on having thrown off all such superstitions, remnants of magical belief are found even among fairly intelligent people,

and many of these are regarded seriously. Under this head come all the delusions about broken mirrors, walking under ladders, the number 13, Friday, lucky coins, spilling salt, wish-bones, black cats, opals, and a thousand other things that are supposed to bring good luck or bad luck. Medical superstitions also remain too numerous to mention. Any almanac will give a list of zodiac signs which are believed to govern the planting of crops, the treatment of farm animals, and to perform other functions equally magical, even to influencing the character and fate of those born under them.

In place of the old magician, we have today the fortune teller, the clairvoyant, the crystal-gazer, the palm-reader, while many of the practices of the spiritualistic mediums, and such contrivances as the ouija board are looked upon by most scientists as relics of the magic arts.

THE WITCH DOCTOR'S "WATCH DOG"



The African witch doctor is away, and he has set up this grotesque image before his door. He has no fear that burglars will visit his establishment during his absence, for no native would be foolhardy enough to brave the mighty powers which he believes this image possesses.



## How Modern Magicians Mystify Their Audiences



Pulling a rabbit out of a hat, the classic trick of stage magic. The performer is John Mulholland.

**T**HE FIRST magicians were primitive priests. In order to impress their tribesmen with the power of the gods, they would perform certain tricks which they had discovered. Savage medicine men, for example, pretended to remove, from the bodies of sick people, stones and other objects, which they claimed had been conjured into the invalids by unfriendly sorcerers. What they really did was to conceal the objects in their clothes

when they went to call on sick people. If the invalid had any pain he would be asked to point out where it was. The medicine man would then secretly take the object from his clothes, hide it in his hand, and then pretend to pluck it from the painful spot. They had few tricks and they were all simple.

This priestly magic continued for thousands of years before there was any other kind of magic. Even today many savage tribes have magician priests. In civilized countries, too, men use magic tricks while pretending that they are able to foretell the future.

### Origin of Magic Entertainment

What we mean by magic today, however, is a form of entertainment. The magician is an entertainer—an actor pretending that he can do the impossible. Modern magic does not come down to us from the work of the pagan priests, but from the traveling entertainers of the Middle Ages. There were musicians, storytellers, and acrobats, as well as magicians, among those gipsy-like strolling players. They performed in the castles for kings and nobility and in the market places for the common people. At first these magicians, too, knew but few tricks. The difference between them and the earlier self-styled sorcerers was that the magicians claimed no alliance with devils or pagan gods. They offered their magic merely as entertainment.

Little by little, during the centuries, magicians invented

further feats. They wished to be thought wise and therefore called their performances "amusing physics" and "natural magic," and styled themselves scientists and "professors." Even during the last century almost all magicians were called "professors." In order to carry out their pose as scientists they used very complicated-looking, gaudily painted apparatus, and presented their tricks with the aid of magnetism, electricity, and other natural forces little known to their audiences.

### Tricks Change as Science Spreads

Science and invention have gone so far in the last 75 years that many of the old tricks would now be laughable. Audiences were once tremendously impressed when a voice came out of a trumpet, which was swung on cords from the ceiling. Today audiences would imagine, though wrongly, that radio was used. It became necessary for magicians to give up most of their elaborate mechanical tricks and their scientific claims when everyone became used to having mechanical things around the home.

The way in which secret knowledge can be made into a feat of magic was shown by the explorer who fell among wild Indians. Some of the Indians were kind to him—they fed and protected him; some of them were unpleasant and hostile. To the friendly Indians he gave presents of common matches. To the unfriendly Indians he gave safety matches, which looked the same to them. Thus his friends got matches which would strike anywhere, and they were able to light their campfires without bow and drill or flint and steel. But his enemies could scratch until they were tired without getting a spark. Yet when they brought back their safety matches to complain about them, the explorer would strike the

### STREET MAGICIAN OF NAPOLEON'S TIME



This old print shows a traveling magician performing simple tricks in a public square. Notice the apron with the large pocket, which was the badge of his profession.

matches on the box which he had kept, and give the Indians a lecture on the duties of hospitality.

The explorer was a magician to the Indians, but not to the people who were familiar with matches. To be a magician to civilized audiences, a man needs, besides his secret knowledge, three things: psychology (which in this case means knowing how to keep the audience from noticing all that is being done), skill of hand and body, and special apparatus. When he has these three elements, he can, with the proper acting, make them into magic. The true art of magic lies in the performance. The tricks alone are merely puzzles, and what makes them mystifying and entertaining is the way they are done.

#### The Psychology of Deception

Undoubtedly the most important factor is that the magician should keep the audience from noticing all he does. That is called the psychology of deception. If you are able to control people's attention, you can be a magician with little skill of hand and no apparatus.

For instance, you can start playing with a coin. Accidentally, you drop it on the floor. If you can im-

only forgets that you have done it, but scarcely notices your movement at the time it takes place.

Another device is to make people look away from you during part of the trick. You merely call their attention to something at a distance. If this is done naturally and with a reasonable excuse, everyone will follow your suggestion. So long as the attention of the audience is fixed on something else, what *you* do will escape notice.

Distraction of the mind may be just as important as distraction of the eye. By this means the magician draws attention away from his method. If he is doing a mechanical trick, he talks about skill of hand, magic words—anything but mechanics. He tries to mislead the thoughts of the audience.

Robert Houdin, the great French "father of modern conjuring," provided a fine example of this when his government sent him to Algeria. His task was to discredit the tricks of the native priests (who kept encouraging rebellion) by showing tricks better than theirs. Among his favorite tricks was that of a wooden box with an iron bottom, which could be immovably

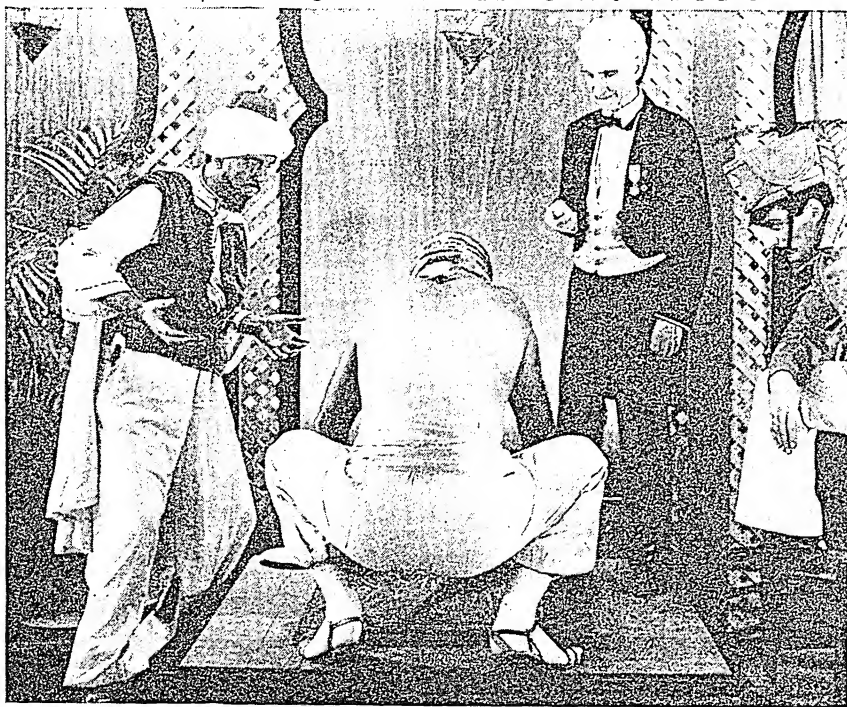
stuck to the stage by turning on a strong electromagnet. Houdin announced that he could make anyone, no matter how strong, as weak as water. He called on a powerful Arab and told him to lift the box, which the man did with ease. Then Houdin said that he would take the man's strength away with a magic word. The word, of course, was a signal to a helper to turn on the electromagnet. Then Houdin defied the Arab to lift the box. The Arab wrestled until he was breathless, but he could not get it so much as an inch off the floor. From this the Algerians concluded that the French could bewitch them, and they fell away from their priests.

#### Importance of Timing

Another element of the psychology of magic is timing. In this, magic is rather like baseball batting. The batter must not only swing his bat to the right spot, but he must swing it at the right instant. According to the manner in which an action is performed and the time at which it is done, a magician can impress an audience with what he is doing, or he can make them fail to notice that he did anything at all.

In the trick of making a coin disappear, you would surely be found out if you simply dropped the coin,

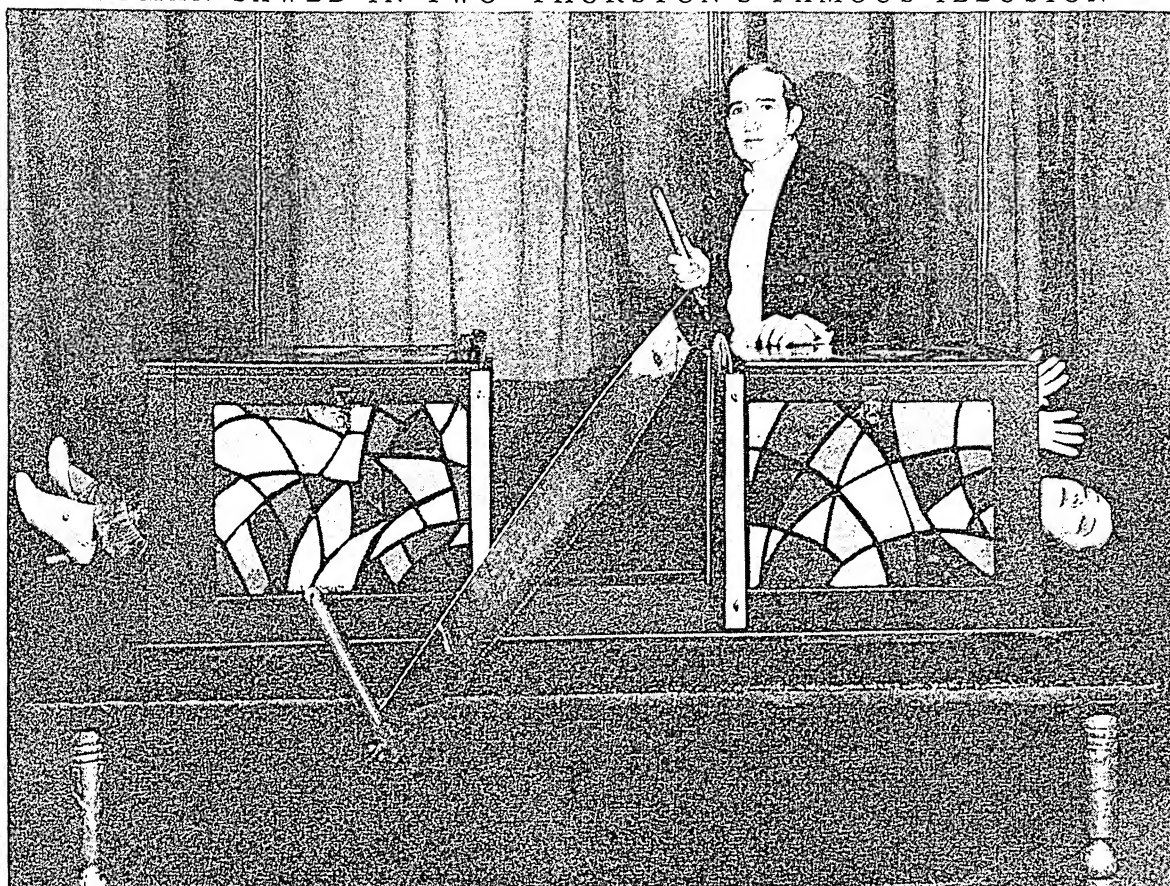
#### ROBERT HOUDIN'S HISTORIC TRICK



How Houdin stopped a rebellion is described in the text. The trick was reproduced in this scene from the film called, 'The March of the Years'. The noted magician, Elmer P. Ransom, plays the part of Houdin, and John Mulholland plays the rôle of the baffled Algerian priest.

itate—convincingly—the familiar action of picking it up, no one will suspect that you have actually left it on the floor, even though you have not taken the precaution of stepping on the coin as you pretend to pick it up. Then a few moments later you can show that your hands are empty, and people will be vastly surprised that the coin has disappeared. Because you have done a perfectly natural act, the audience not

## 'WOMAN SAWED IN TWO'—THURSTON'S FAMOUS ILLUSION



In this spectacular trick, a woman stretched herself out inside the coffin-like box, the sides were closed, and Thurston sawed down through a joint in the middle. Then the halves of the box were pushed apart with the result shown here. Many explanations of the trick have been offered, including the obvious suggestion that two women were used. But Thurston never made public his method. Professional magicians are bound in honor not to reveal their secrets or those of their colleagues.

pretended to pick it up, and said, "It's gone!" After you have pretended to pick up the coin, you continue to act exactly as you did before—you go on apparently passing it from one hand to the other. Soon everyone has forgotten that you dropped the coin. The audience is positive it is still in your hands. Some, indeed, will be willing to swear later on that they actually saw it. It will be easy, then, for you to say, "I am going to make this coin disappear. Watch. It's gone!"

This is the simpler kind of deception—pretending to do a familiar action (handling the coin) without really doing anything. The other kind is doing a secret action in addition to what you seem to be doing. If you pretend to take a coin in your left hand, really retaining it in your right, and do it convincingly enough, everyone will believe that the coin is in your left hand. Later, when you open that hand, the coin, from the audience's viewpoint, will have mysteriously disappeared. But your finger skill will be useless if your timing is wrong.

#### Sleight of Hand and Showmanship

Most people have a wrong idea of sleight of hand, probably from the untrue slogan, "the quickness of the

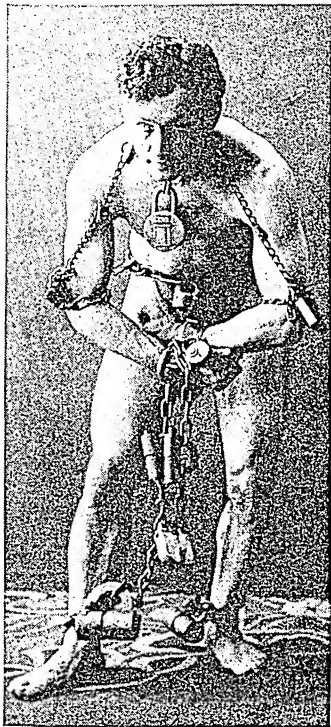
hand deceives the eye." Sleight of hand must be done slowly and gently, for quick, jerky motions attract attention, and the art of the magician lies in keeping attention away from his secret actions. The very slogan about the "quickness of the hand" is repeated by some magicians to mislead the spectators, so that they will watch alertly for some swift movement by the performer and fail to notice the normal motions with which the trick is actually done.

The great sleight-of-hand performers, like Leipzig, Victor, Cardini, Mora, and the Bambergs, are distinguished, not by quickness, but by absolute naturalness and perfect certainty of motion. Sleight of hand is like surgery, not like fast piano playing. Pianists and many other musicians, to say nothing of jugglers, are trained for quick motions, but the eye is never deceived. Sleight of hand is merely doing a little more, or a little less, than you pretend to do.

Another important element in magic is to present the tricks so that the audience likes them. The magician's term for this is "showmanship." It is really the psychology of presentation. It means that the magician interests his audience in his work by his pleasing



## HE LAUGHED AT LOCKS



Harry Houdini won world-wide fame for his ability to get out of prison cells and to escape from handcuffs.

hardly a familiar small object which has not been used for a trick, but coins, pieces of paper, cards, handkerchiefs, rope and string, eggs, and balls are most commonly used. It will be found that once a trick has been learned with an egg, for instance, it can also be done with a ball, or a rolled-up handkerchief. Feats in which people or large animals play a part usually can be done only on a stage and they require special mechanical equipment.

Professional magicians tend to specialize along certain lines. Alexander Herrmann did mostly small tricks. Harry Kellar, Howard Thurston, Horace Goldin, and Nicola became famous because of their large tricks—making a girl float in air, or sawing her in half, causing a horse to vanish, or making a lion in a big iron cage mysteriously appear. Houdini achieved his fame with tricks which permitted him to escape from any box, bag, or handcuffs into which he was put. T. Nelson Downs specialized in tricks requiring only coins, and Gus Fowler did his tricks only with watches and clocks.

manner, his friendly conversation, and by his knowing at all times just what to do next. A boring person who has learned some tricks is still boring, even if the tricks are puzzling; an entertaining person who knows tricks is a magician.

#### Equipment of the Magician

There is a vast amount of apparatus designed to help the magician perform his mysteries. It would take a much larger volume than this to list it all. Much of the apparatus is never seen by the audience at all and frequently the equipment which is shown to the audience has very little to do with the trick. There is

Magicians like to make their tricks seem like the things done in fairy tales. Because stage magic and fairy tales are so much alike, many people forget to distinguish one from the other. There is an old Chinese fairy tale about a boy who threw a rope up in the air in such a way that it stood on end. The rope then grew until its end was away up in the sky. The boy climbed up the rope and disappeared. The story is very much like Jack and the Beanstalk. Someone forgot that he had merely read about the boy and the rope, and told of having seen it all done by "a famous Hindu magician."

All over the world, people who knew nothing about magic believed him and kept the old tale alive.

#### How to Learn Magic Tricks

The way for you to learn to do magic is, first, to read books describing tricks. When a trick particularly appeals to you, study it until you know just how to do it; practise that one trick over and over until you can do it very smoothly. Then pick out a second trick and learn to do it well.

Do not try to learn to do more than one trick at a time. As a beginner you will be wise to limit yourself to only five or six tricks until you have so perfected yourself in doing them that people are interested and entertained in watching you perform. When you have reached the point of being able to entertain with half a dozen feats of magic, you will find it easy to add more elaborate tricks to your program from time to time.

(For books about magic and magicians, see the section on Magic in the bibliography that accompanies the article Hobbies.)

## MAGICIAN PLUS ACTOR



John Mulholland perfected the blend of skill in magic with stagecraft. Here he is a "Japanese magician."

## MASTER AT SLEIGHT OF HAND



Cardini has just "found" that fan of cards in the air. Only years of practise could account for his smooth and graceful technique.



**MAGNA CARTA.** "Why do they not ask for my kingdom? I will never grant such liberties as will make me a slave!" Such was the angry answer of King John of England to the first demand of his barons for a charter of reforms.

His tyranny, his wickedness, and his weaknesses had united against him all classes of his kingdom — nobles, churchmen, and townsmen. And while he was waging a losing war on the Continent, seeking to recover his French dominions, the leading barons of England had secretly met together and sworn to compel the king to respect the rights of his subjects, as provided by previous law and custom.

In various ways John sought to break up the forces that confronted him, but even his assumption of the Crusader's cross was in vain. On June 15, in the year 1215, he at last met the nobles "between Staines and Windsor, in a meadow which is called Runnymede," on the Thames River. Deserted by all but a handful of personal followers, he was forced to affix his seal to the Great Charter—called Magna Carta in Latin, the language in which it was written. In every great controversy between the crown and the representatives of the nation since that time this immortal document has been invoked and today it is still regarded as the chief bulwark and defense of men of English speech everywhere against tyranny and arbitrary power.

It is said that when King John granted the Great Charter he smiled and spoke pleasantly to the lords about him, but that as soon as he reached his own chamber he threw himself on the floor in a mad rage, gnashing his teeth and biting the rushes with which the floor was strewn.

#### Foundation of English Law

Since that day the Charter has been confirmed repeatedly by succeeding kings of England, and has become a part of English law, and the foundation of the constitution of every English-speaking nation.

Historical students today agree that the barons were not so unselfish as once was thought. They were chiefly interested in securing their own rights and they paid little attention to the rights of the common people or the constitutional liberties of the realm as a whole. Thus the charter in its 63 "chapters" or sections deals for the most part with feudal rights and duties which became obsolete when feudalism died out. Its chief permanent importance is that it established the principle that "the king is

below the law" and not above it. In later days new and more liberal meanings were read into some of its provisions, and so all classes came to reap the benefits

which the barons won for themselves. But modern writers find in it no such guarantees of jury trial or power of parliament over taxation as were found in the Charter by 17th- and 18th-century legal writers.

Two of the most important provisions of the Great Charter are these:

"No free man shall be arrested or detained in prison, or deprived of his freehold, or outlawed or banished, or in any way molested; and we will not set forth against him, or send against him, unless by the lawful judgment of his peers and by the law of the land."

"To no one will we sell, to no one will we refuse, or delay, right or justice."

**MAGNESIUM.** Two qualities make magnesium conspicuous among the metals: first, it is the lightest of the common metals; second, powdered or shaved into thin strips it burns almost unquenchably. Hence it is in great demand for alloys to make airplanes and for incendiary bombs and flares. It is about one-third lighter than aluminum.

Magnesium is one of the most abundant substances in nature, but it is too active chemically to exist free. One of the common ores is *magnesite* (magnesium carbonate,  $MgCO_3$ ), a marblelike rock used in making firebrick. Another is *dolomite*, a calcium magnesium carbonate. Two magnesium salts, the chloride and the sulphate, are abundant in sea water. A cubic mile of sea water contains about five million tons of magnesium. Another source is the brine wells of Michigan that are the basis of Michigan's great chemical industry.

Before war broke out in 1939, world production of magnesium was about 30,000 tons a year. The United States got about 3,500 tons from wells at Midland, Mich. War demands then led to an American program for producing several hundred thousand tons a year, in part from sea water at Freeport, Tex., and in part from ore deposits in California, Nevada, Washington, and Texas. Sir Humphry Davy proved the existence of magnesium in 1808; the pure metal was obtained in 1830. The mild alkali, *milk of magnesia*, is  $Mg(OH)_2$  dissolved in water.

**MAGNET.** To see "modern magic" at work, we need only notice how steel scrap is moved in a modern mill. A traveling crane drops a huge metal disk upon the scrap, and instantly hundreds of pounds of metal cling to the disk. The crane moves the load wherever it is wanted, and presto! the metal falls off as though released by magic. Actually, of course, the only "magic" is the use of the once mysterious force of magnetism.

#### THE SIGNING OF MAGNA CARTA



At the demand of barons and churchmen, King John signs the document that put the law above the royal will.

This machine is simply a powerful electromagnet, big brother to the tiny toy "horseshoe" magnets.

What is magnetism? For centuries men have known that a certain iron ore, popularly called "lodestone," has the remarkable property of attracting other bits of iron. Because it was found in large quantities near the ancient city of Magnesia in Syria, the early Greeks and Romans called lodestone *magnes*, from which "magnetism" is derived. Those early investigators discovered that the magnetism of lodestone is "catching." Iron rubbed over lodestone becomes itself magnetic.

#### North and South Poles

If you test a magnetized knitting-needle, you will find that either end will attract unmagnetized iron equally well. The ends seem to be alike; but they are not, as you will quickly see if you suspend the needle from a fine thread tied to its middle. The needle will swing around until one end points toward the north and the other toward the south. This is why every magnet is said to have two poles—a "north-seeking pole" and a "south-seeking pole," usually called simply the *north pole* and the *south pole*. This principle gives us the magnetic compass (see Compass, Magnetic). If you bring another magnetized knitting-needle near the first one, you will observe another fundamental principle of magnetism. While the north-seeking end of one needle will be strongly attracted by the south-seeking end of the other, the two "norths" and the two "souths" will vigorously *repel* each other. The rule is that unlike poles attract; like poles repel.

Dr. William Gilbert (1540–1603), leading scientist in England during Queen Elizabeth's reign, first realized from the behavior of small magnets at various points on the earth's surface that the earth itself is a gigantic magnet. But we must note that what we call the earth's "north pole" in the geographic sense is in the terminology of mag-

netism really its south-seeking pole, since it attracts the north-seeking poles of ordinary magnets (see Earth).

The space around a magnet in which its influence is exerted is called its "field." Through this field appear to run "lines of force" with a definite direc-

tion or "flux," as illustrated by the pictures on the next page. If we place a piece of iron in this field, the lines of force will tend to crowd into it, because they travel through iron easier than through air. In technical terms we say the "magnetic permeability" of iron is higher. This helps explain how the "catching" quality of magnetism extends more or less throughout the magnetic field, so that magnetism can be transferred or "induced" without actual contact. An interesting proof of this and other important magnetic facts can be given with the aid of a bar of soft iron and a compass. First, test the bar with the compass to make sure that it is not already magnetized. Next, point one end of the bar toward the north pole (as indicated by the compass) and strike the other end a few sharp blows with a hammer. Now test the bar again, and you will find it has become magnetized.

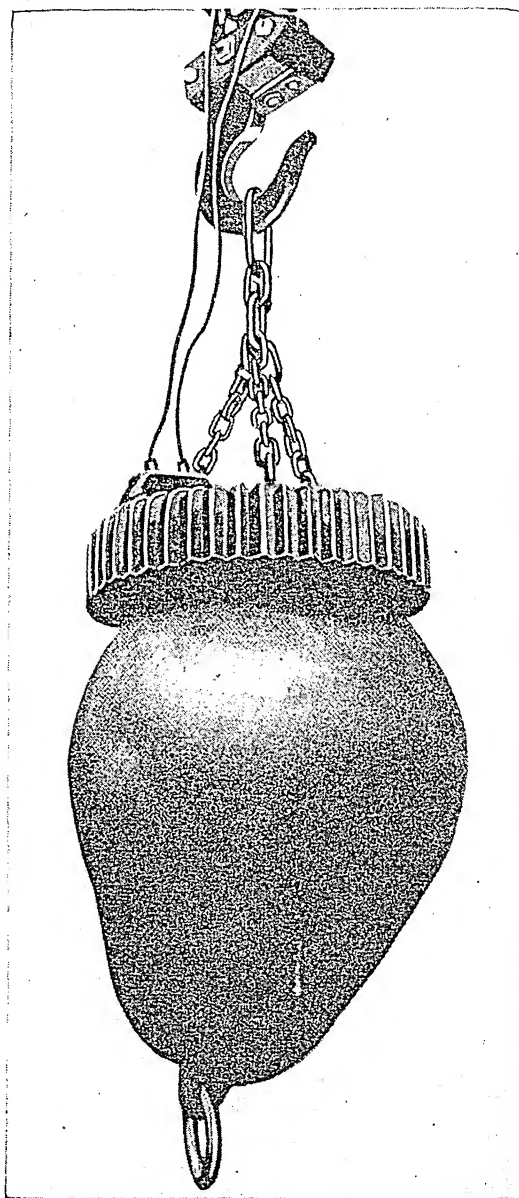
#### A Theory of Magnets

What has happened? The magnetic lines of force in the earth's field have induced magnetism in the iron. According to the theory of magnetism, each of the millions of molecules of iron that make up the bar is a tiny natural magnet; but these are ordinarily arranged in a helter-skelter fashion, so that they neutralize one another. When the hammer jars them, a great many of them swing around in line

with the earth's magnetic field. As proof of this, turn the bar east-and-west and hammer it again. You will find its magnetism has vanished. The molecules have been disarranged and no longer work in harmony.

This theory that all magnets are made up of tiny lined-up molecular magnets rests on many other

THE "SKULL CRACKER" AT WORK



A powerful lifting magnet is here shown raising a huge piece of metal weighing 12,000 pounds, known in the slang of the shop as a "skull cracker." The "skull cracker" is used to break up metal castings. When the current is turned off, it falls on them with shattering force.

facts. Heat a permanent magnet red hot, which disturbs its molecular structure, and its magnetism disappears. Break a magnet in two, and a new north pole and a new south pole will be formed at the break. Hard steel, in which the molecules are densely packed together, is much harder to magnetize than soft iron, but keeps its magnetism better once it is acquired.

Some other metals, chiefly nickel and cobalt, have magnetic properties similar to those of iron, though much feebler. Mixing these with iron, however, often yields alloys of great magnetic value (*see Alloys*).

Permanent magnets play an important part in our lives. They are used in telephone receivers, speedometers, electrical measuring instruments, magnetos, and countless other devices. Usually they are bent in horseshoe form, which, by bringing the poles close together, concentrates the strength of their field.

#### Electricity and Magnets

The connection between electricity and magnetism, described in detail in the article on Electricity, is one of the most important principles of science and industry. It is the basis of the electric generator and motor, giving us power, light, and transportation; of the telegraph and telephone; and of many of the essentials of radio. Here we need only examine a simple electromagnet.

Take a short iron rod, like a common bolt, and wind around it about 50 turns of insulated wire. Connect the ends of the wire to an ordinary dry cell. At once the bolt becomes a strong magnet. Disconnect the wire and most of the magnetism disappears. Here we have the essential value of the electromagnet—that its action can be controlled at will. In all other essentials it obeys the same rules as a permanent magnet. A simple way to determine its polarity is to grasp it with the right hand so that the fingers are pointing in the direction in which the cur-

rent is flowing (positive to negative) around the turns of wire, then the thumb will point to the north pole of the magnet. The strength of an electromagnet depends upon the number of turns of wire and the amount of current flowing through them.

**MAGNOLIA.** The creamy-white blossoms of the great-flowered magnolia make this tree a veritable queen of our parks and gardens. The glossy evergreen leaves form a fit setting for the flowers, which are often eight

to twelve inches in diameter. The flowers emerge from their furry brown buds in May and June and are succeeded by conelike fruits which are reddish when ripe. In its natural state this tree attains a height of 70 to

100 feet, having a straight trunk and spreading limbs. It is native to the southeast, from South Carolina to Louisiana. The perfume is heavily fragrant.

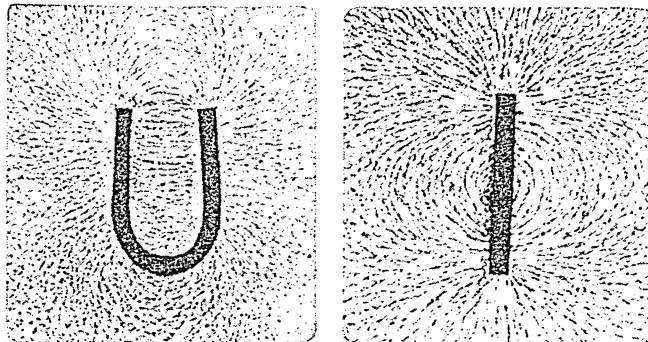
The sweetbay is very much more widely distributed than the great-flowered species, but neither in size nor beauty can it compare with its magnificent cousin. It is native from Massachusetts to Florida and westward to Louisiana, varying from a mere shrub to a height of 50 to 60 feet. The cucumber tree, which bears greenish-yellow blossoms, is another American type. It is so named from the fruit, which when green resembles a cucumber.

#### Found in Many Lands

Altogether there are about 35 species of magnolia, native to the Himalayas, India, and other regions in Asia as well as to many parts of Central and North America. Some are evergreen and others deciduous, while the blossoms range from white and light yellow to deep rose and purple.

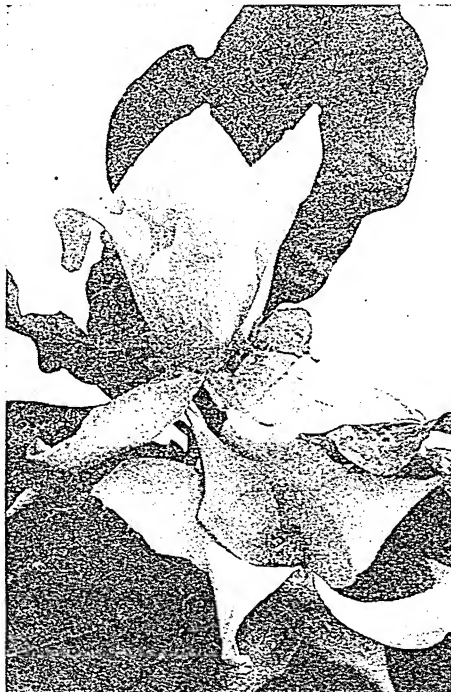
By selection and cross-breeding additional beautiful varieties have been produced, which flourish in hothouse, garden, and park. The range of some species has been extended and beautiful specimens may now be found flourishing in regions far separated

#### WHAT THE IRON FILINGS TELL



Two magnets—a horseshoe magnet and a bar magnet—are shown here, each covered with a sheet of glass upon which iron filings have been sprinkled. The filings have arranged themselves in symmetrical patterns, which show us how the lines of magnetic force are exerted in the surrounding space and from pole to pole.

#### MAGNOLIA IN FULL DRESS



Distinguished by leaves much larger and longer than those of other magnolias, the umbrella tree grows from Pennsylvania south to Alabama and Mississippi. The flowers of this species have an unpleasant odor. The fruit cone is rose-colored.

from their native haunts; for instance, the great-flowered magnolia is found as far north as Pennsylvania, and Chinese species grace gardens in both England and America. The genus is named for Pierre Magnol, a French botanist of the 17th century.

Scientific name of the great-flowered magnolia, *Magnolia grandiflora*. Bark brownish-gray, with scales of about one inch in length, lying close together. Leaves simple, alternate, evergreen, entire, ovate. Flowers cream-white, with heavy lemon fragrance; 6, 9, or 12 petals. Fruit a reddish conelike pod, about the size of a hen's egg.

**MAGPIES, JACKDAWS, AND ROOKS.** These noisy birds are a robber-band that, with the jays and ravens, belong to the crow family (*Corvidae*). Magpies are handsome birds, from 16 to 20 inches long, with glossy black and snow-white plumage, and long pointed tails. They are found in the Old World and in western North America. If encouraged they make friends with human neighbors and are easily tamed. The magpies build their nests with consummate art, leaving a hole in the side for admittance, then covering the whole upper part with an interweaving of thorny sticks. This serves as a retreat protecting them from the attacks of other birds. The magpie is a crafty rascal, accused of every crime. To other birds he is ever a foe, and sometimes he becomes too familiar with human property. His call is a rasping *cack, cack*, and a garrulous gabble intermixed with whistling notes. Hence he is a "chattering magpie."

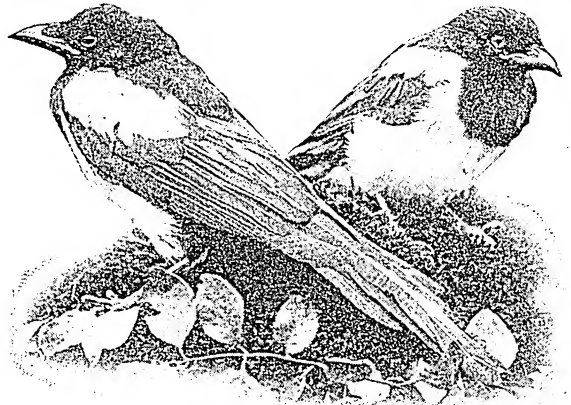
The jackdaw and rook are both Old World birds. The rook, a bit smaller than the crow, has a decided purplish tinge over his plumage. The adult birds shed the face feathers, leaving the skin about the bill bare. They feed entirely on insects and grain. Rooks nest in large communities or rookeries. The winter habits vary; some migrate south and some remain in the same district throughout the year. The jackdaw

SOCIETY LIFE IN  
ROOK TOWN



These are rooks—English rooks—a little group on a dead tree by a wall. In their nests among the old elms of the English estates you will find them by hundreds and by thousands, particularly in the evening when they come to roost.

## THE AMERICAN MAGPIE'S MOTLEY COAT

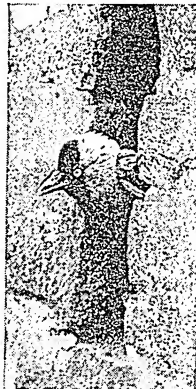


A striking suit of black and white and a long tail, black with greenish iridescence, make the American magpie conspicuous. He finds much of his food on the ground, and hops about with great agility picking up grubs, snails, and grasshoppers.

wears a black coat with a gray collar. Its food habits are like those of the rook, with which it often lives in company. Jackdaws find almost any nook or cranny a suitable nesting site; rock cavities or chimneys are equally acceptable.

Scientific name of American magpie, *Pica pica hudsonia*; of rook, *Corvus frugilegus*; of jackdaw, *Corvus monedula*. The yellow-billed magpie, *Pica nuttalli*, inhabits California.

AT HOME!



Jackdaws are not very particular where they build their nests—abandoned rabbit holes, church belfries, holes in rocks. But they become very fond of these nests once they have picked them out, and come back to them year after year.

**MAHOGANY.** Prized for its beauty, durability, and ease in working, mahogany has long been used for building ships and for making fine furniture. The Spanish colonists found the wood when they came to the New World and were soon using it to repair their sailing vessels. No one knows when mahogany was introduced into Europe, but by the 18th century it was considered by English cabinetmakers to be the most elegant of all woods.

The mahogany tree is an evergreen and grows in the West Indies and tropical America. It often attains a height of 100 feet, with a trunk 12 feet in diameter and a reach of 60 feet or more to the first limb. Although the supply is abundant, the wood is expensive because of the tremendous labor involved in getting it. There may be only one or two trees to the acre of dense forest, and paths connecting with the main trails must be cleared to each tree before felling can begin. In most places, after the tree is cut, it must be dragged by oxen or tractors to a river bed to wait for the floods to carry it to the seaboard. In only a few locations can the logs be transported by barge and train.

In color, mahogany ranges from light reddish tan to deep golden brown. In grain it varies from the plain stripe of the main trunk to the swirling, figured



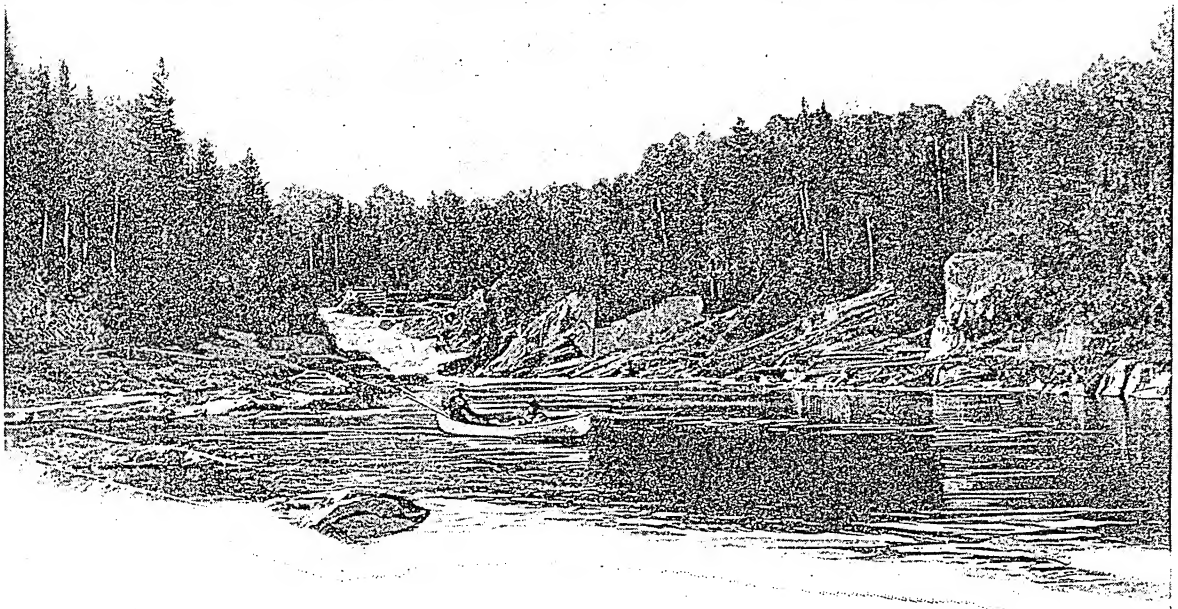
patterns near roots and limbs. It takes a high polish and need not be heavily stained, for it grows darker with age. Since it does not warp or shrink easily and glues well, it is much used for veneers. Because it can be formed easily and withstands dampness well, it is widely used for building small boats.

Genuine mahogany is usually sold under the name of the place from which it comes, for example, "Honduras mahogany," "Cuban mahogany." Because of its popularity, the name has been applied to many unrelated woods, such as certain hardwoods imported from the

Philippines as "Philippine mahogany," and Khaya wood sold as "African mahogany." These are in themselves good woods, but others, including birch and gumwood, usually considered inferior to mahogany, are often stained and patterned to resemble it.

True mahogany belongs to the genus *Swietenia*, of the family *Meliaceae*. Principal species, *S. mahoganii* (Florida and West Indies) and *S. macrophylla* (Mexico, Central and South America). Chief source of "African mahogany," *Khaya ivorensis*; of "Philippine mahogany," the lauan trees *Shorea negrosensis* and *Pentacme contorta*, and the tangle tree *Shorea polysperma*.

## "Down East" in the PINE TREE STATE



**MAINE.** Maine is the child of Massachusetts, of which it was a part until 1820. Perhaps the parental relation explains why Bostonians still talk of going "down to Maine," as "down-easters" from Maine talk of going "up to Boston" or "up to Massachusetts."

Maine today owes little to her parentage and much to her thrifty people and to her rich heritage of picturesque lands and waters. On the southeast are the deep cool waters of the Atlantic, delightful caves and bays, and a much indented and picturesque coast with excellent harbors protected by numerous islands. Covering the greater part of the state are great wooded wilds, splashed with countless lakes and cut by numberless rivers and streams—a woodland where Rhode Island and Connecticut might be placed and lost to the world and to each other. For over half a century people have been coming here for recreation and rest,

*Extent.*—North to south, 303 miles; east to west, 212 miles. Area, 33,215 square miles (of which 2,175 square miles are inland water surface). Population (1940 census), 847,226.

*Natural Features.*—Hilly surface with scattered mountain peaks. (Mount Katahdin, 5,268 feet). Largest lake, Moosehead. Principal rivers: Kennebec, Androscoggin, and Penobscot. Mean annual temperature, 42°; mean annual precipitation, 40".

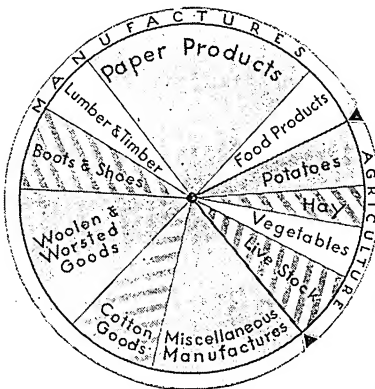
*Products.*—Potatoes and other vegetables, apples and pears, hay; poultry, cattle and dairy products; herring, lobster, cod, and other fish; paper, pulp, lumber products; cotton and woolen goods, boots and shoes; canned foods, granite, limestone, clay products, slate.

*Cities.*—Portland (73,643), Lewiston (38,598), Bangor (29,822), Auburn (19,817), Biddeford (19,790), Augusta (capital, 19,360).

and the 800,000 pleasure seekers who now visit it each year find the same primitive charm that Thoreau and other tourists found a hundred years ago. Rolling hills and valleys cover most of the surface, with many low

bare mountain peaks in the north and west. The solitudes are frequented by big game, the streams are full of fish, and the lakes abound with water fowl. Though railroads now cover or touch on every county, the rivers and lakes and the old trails winding here and there through the forests are still much traveled, just as they were in the days of the first explorers. Even Indians are not altogether lacking, for a few members of the once powerful Penobscot tribe remain to act as guides for tourists. You can drive up in an automobile to one of the many modern hotels; but you need go only a few rods away from the road and the clearing to be in the wildwood again.

THE "PINE TREE STATE"—ITS  
SURFACE, ITS PRODUCTS,  
ITS OCCUPATIONS



Nor is pleasure all that the wilderness yields. An immense amount of timber is cut from it every year to be floated down the great rivers to the cities and there converted into lumber and wood-pulp. Nearly 80 per cent of the land area of the state is forested. Its giant white pines, still abundant, gave Maine the name "Pine Tree State." Its great stands of spruce make it one of the leading states in the production of pulp and paper. The shift in recent years from lumber and timber to pulp and paper made ghost towns of once thriving cities and gave birth to new ones. Bangor, on the Penobscot River, once a great lumber market, is now primarily a commercial and tourist center for the lake region to the north. On the other hand, such towns as Winslow, Millinocket, Rumford, and Woodland owe their growth almost wholly to the pulp industry. All have the advantage of proximity to the forests and water power to operate their mills. Augusta, the capital, on the Kennebec River, also has paper and pulp mills as well as textile mills and shoe factories.

Although the soil is ungenerous for the most part, farming has recently shown phenomenal development in the most northern county—Aroostook. The fame of this section has gone all over the world as a region for the growing of potatoes. Modern methods in cultivation, combined with the unusual adaptability of the soil, not only make the average yield per acre exceptionally large but produce stock unexcelled for either food or seed. Hay, grain, and other crops also grow well in this section. South of the forest region



AGRICULTURE

MANUFACTURING

TRADE AND  
TRANSPORTATIONOTHER  
OCCUPATIONS

milk and vegetables and fine winter apples are produced for the cities, and immense quantities of apples, squashes, blueberries, and sweet corn are canned and shipped. Maine-packed sugar corn leads in all the markets, and is claimed to excel that of all other states in quality.

Waterfalls and swiftly flowing rivers make Maine rich in natural water power and have attracted many factories. Chief among them are those producing paper, wood-pulp, and other timber products, cotton and woollen goods, boots and shoes, while canning and preserving are also important industries. Up to 1890 Bath was the chief shipbuilding center of the United States, and nearly half of the ocean vessels

of the country came from Maine. With the decline of the use of wooden vessels, however, the industry decreased, and not until the World War did Bath again come into prominence as a great shipbuilding center.

The fisheries of Maine are second among those of the New England states. Lakes and rivers abound with many kinds of fish. Commercially, herring (canned as "sardines"), haddock, cod, and lobsters and clams are the most important.

Maine ranks high in output of granite; it also produces limestone, clay products, slate, mica, and feldspar. A wide variety of minerals is found in the old worn-down mountains, but seldom in workable quantities. Maine has, however, a remarkably large number of rare minerals, among them pollucite, source of the metal caesium, used in radio and television tubes; beryl, source of beryllium, which is lighter and stronger than aluminum; and minerals for gems, such as tourmalines, golden beryls, amethysts, topazes, garnets, zircons, and many others.

Portland, the largest and wealthiest city in the state, as well as one of the most beautiful in all New England, is renowned as the birthplace and early childhood home of Longfellow. Many densely shaded avenues have earned for it the title, "Forest City." It is picturesquely situated on a peninsula extending into the island-dotted Casco Bay. Recalling his childhood, Longfellow says:

I remember the black wharves and the ships,  
And the sea-tides tossing free;  
And the Spanish sailors with bearded lips  
And the beauty and mystery of the ships  
And the magic of the sea.

Great steamers and graceful yachts have taken the place of the schooners and market boats that Longfellow knew, and busy factories have sprung up in the city of Portland.

Lewiston, second city in size, looks across the banks of the Androscoggin River to Auburn. These municipalities are really one large community in all respects except government; they form the largest industrial unit in the state. Close by are an important group of thriving towns and a fertile agricultural region. Large manufacturing plants, with payrolls of over \$6,000,000 annually, produce textiles and shoes.

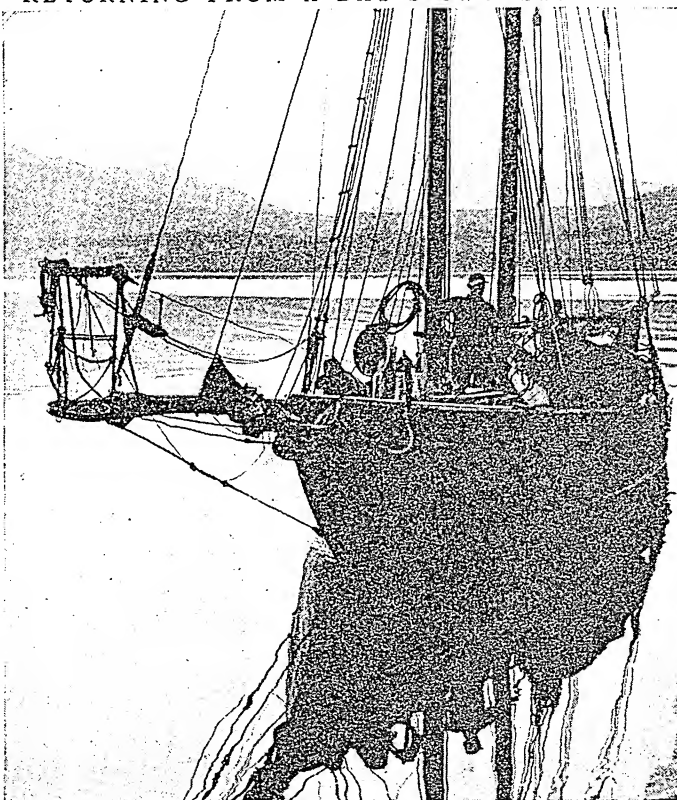
Along the same river is Brunswick, home of Bowdoin College, founded in 1794. Here Longfellow studied with his college mates, Nathaniel Hawthorne and Franklin Pierce, later president of the United States, and here Longfellow was for seven years a professor. The University of Maine is at Orono. Among other important educational institutions are Bates College at Lewiston; Colby College at Waterville; Bangor Theological Seminary at Bangor; Ricker Classical Institute at Houlton. Teachers are trained at Presque Isle, Castine, Farmington, Fort Kent, Machias, and Gorham.

Many of the old academies, the forerunners of the present high schools, are continuing their work, notably Fryeburg Academy, at Fryeburg, where Daniel Webster taught.

#### The Climate and Summer Resorts

Maine's climate is cooler than might be expected from its latitude because of currents from the North Atlantic. The cold of winter, however, has a uniformity that makes it more agreeable to many persons than the changing temperatures of sections farther south. Thousands of visitors are attracted to Maine during the summer months because the heat is tempered by sea breezes and cool winds from the north. Among the outing places is Mount Desert Island, famous as the site of Bar Harbor, a community of magnificent estates, with stimulating air and incomparable scenery. Here, too, is Acadia National Park, the first national park in the eastern states. It includes most of the island mountains, some of which rise almost

#### RETURNING FROM A DAY'S SWORDFISHING



This schooner makes a profitable occupation of pursuing swordfish, as do many on the Maine coast. A keen-eyed lookout, high in the cross-tree, sights the swordfish, and directs the man at the wheel in the exciting chase. Standing in the little waist-high platform on the bowsprit, a harpooner waits, spear in hand and line coiled, to plunge the harpoon into the quarry when the boat overtakes it. Occasionally a large fish will turn and attack a boat, plunging his sword so deep in the wood that he cannot withdraw it.

out of the ocean itself to a height of more than 1,500 feet. Near New Hampshire are the beautiful Rangeley Lakes, 1,000 feet above sea level—the fisherman's paradise; and farther north is Maine's largest lake, Moosehead. The old fort at Pemaquid, held at different



times either by the French or the English and thrice rebuilt, is preserved in the Pemaquid State Park, not far from Bath.

Various explorers touched the coast of Maine in the 16th and the early part of the 17th centuries, and in these years both France and England claimed the territory. Maine was once a part of Acadia, famous in song and story, for this name was given to the vast grant of land along the east coast, from about New Jersey to Newfoundland, which Henry IV of France set aside for colonization by the adventurous De Monts in 1603. The latter, with Champlain and others, explored the coast in 1604. Maine was also included in the territory granted to the Plymouth Company in 1606 by King James I.

#### First Attempt at Colonization

A colony under the leadership of George Popham landed at the mouth of the Kennebec River in the late summer of 1607, built a fort and 15 cabins, a church, and a storehouse. Courageous, but unaccustomed to the severity of bitter winter weather, most of the group returned with the supply ship in December; and before the remaining members embarked for their homeland in the spring, their brave leader had died.

French colonization was likewise unsuccessful in this period, and before the first quarter of the 17th century had passed, the English were in control.

In 1622, Sir Ferdinando Gorges and John Mason secured a grant in what is now southern Maine from the Council of New England, successor to the Plymouth Company. Well-organized groups of colonists established permanent settlements at York, Saco, Falmouth (now Portland), Cape Elizabeth, Scarborough, and Biddeford. In 1650, Massachusetts began reaching into the territory and annexed towns and bought tracts of land from the Gorges heirs. When a new charter was given the Massachusetts colony in 1691, Maine was a part of it. During the next 75 years colonization continued in the face of bitter conflicts of the New England colonists against the French and the Indians. In these

Maine played an important part. It was the valiant Sir William Pepperell, a native of Maine, who took Louisburg in 1745.

During the Revolution, the British burned Falmouth. Benedict Arnold traveled up the Kennebec and Dead rivers in his luckless march on Quebec. Ships rotted at Maine's docks during the Embargo and Non-Intercourse acts of 1807-09. During the War of 1812, the British plundered Bangor, Eastport, Castine, Belfast, and Hampden.

#### A Missouri Compromise State

Maine was governed by Massachusetts under the name of the District of Maine, until March 15, 1820, when it was admitted into the Union as a separate state under the Missouri Compromise (see Missouri Compromise).

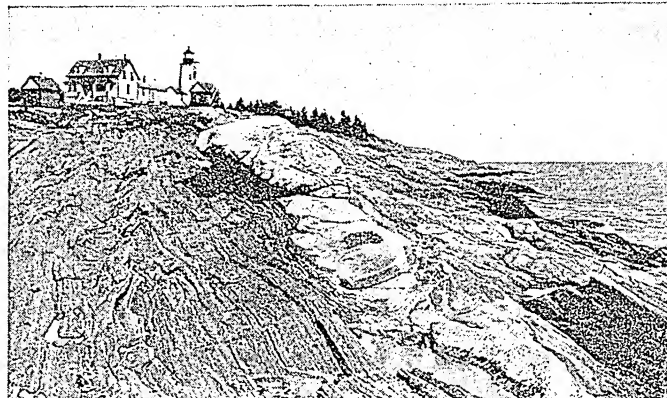
The boundary on the north was long disputed by the United States and Canada. In the treaty at the close of the Revolutionary War the boundaries had been defined in a way that looked very well on paper. However, the two countries could not agree where

they actually should be placed, for the St. Croix River named in the treaty was not the true St. Croix. Furthermore, Canadian lumber cutting in the disputed district of the Aroostook River (now in northeastern Maine) threatened serious difficulty. Although no gun was fired, the long-continued quarrel is known as the Aroostook War. At one time Maine called out the militia and New Brunswick sent two regiments of British regulars. Finally, the Webster-Ashburton Treaty of 1842 divided the region almost equally between the two nations, and thus the dispute ended.

Maine differs from most states of the Union in government. It is still using its first constitution, adopted in 1819. Governor and auditor, both serving two years, are the only state officials elected by the people.

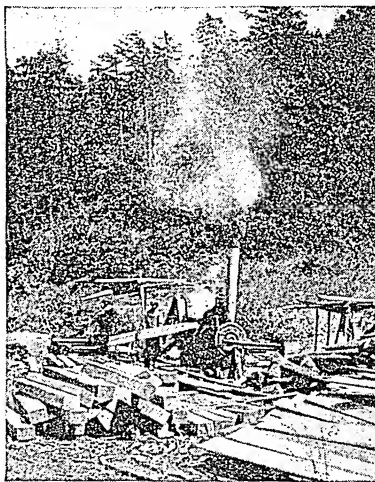
The governor appoints the judges and other officials. He is advised by a council of seven elected by the legislature, which also elects the secretary of state, and other executives. Maine uses the initiative and referendum. It passed a prohibition law in 1851.

#### MAINE'S ROCK-BOUND COAST



Small wonder that a lighthouse stands sentinel here at Pemaquid Point, about 40 miles up the coast from Portland. These relentless rocks would prove stern foes to any unwarned vessels which travel the Maine waters.

#### PREPARING FOR WINTER



Small portable saw mills visit the communities scattered throughout the countryside, and the farmers turn over their logs for cutting into fuel, lumber, or railroad ties, as here.



"As Maine goes, so goes the Union," is a political byword, for Maine holds its state elections in September, two months before the usual elections in all other states, which come in November.

#### Maine's Roster of Notables

Maine counts among its noted men James G. Blaine, twice the nation's secretary of state (*see* Blaine, James G.); Samuel F. Smith, author of 'My Country 'Tis of Thee'; Nelson Dingley, author of the Dingley Tariff Law of 1896; Thomas B. Reed, Republican leader; Hannibal Hamlin, vice-president under Lincoln; and Elijah Lovejoy, who was slain in Illinois because of his anti-slavery activities. Two famous humorists, Edgar Wilson Nye (Bill Nye) and Charles Ferrar Browne (Artemus Ward), were born in Maine, as were Sarah Orne Jewett, writer of New England tales; the publishers Frank A. Munsey and Cyrus H. K. Curtis; the poets Edwin Arlington Robinson and Edna St. Vincent Millay; and Lincoln Colcord, writer of sea stories.

Harriet Beecher Stowe wrote 'Uncle Tom's Cabin' at Brunswick, and Kate Douglas Wiggin and John Kendrick Bangs lived and wrote in Maine for years. Maine was the birthplace of Lillian Nordica, famous opera soprano. The distinguished Maxim brothers—Hudson, inventor of explosives, and Sir Hiram, inventor of the Maxim automatic machine gun—were born and educated in Maine. **MAINTENON, MARQUISE DE** (1635-1719). The story of Cinderella is no more thrilling than is that of the Marquise de Maintenon, who, though born in prison, became the wife of the most powerful king in Europe, the brilliant Louis XIV. After a childhood of poverty, during which she was handed around from one person to another, at the age of 16 Françoise d'Aubigné married the deformed but good-hearted poet, Scarron, who offered either to marry her or to pay her entrance fee into a nunnery. At his death she was again left without money, but through the influence of powerful friends she was appointed governess of two sons of Louis XIV.

Her good influence over the king soon became apparent, and before the queen died she declared that she owed it to Madame de Maintenon that, after 20 years of neglect, her husband again treated her with kindness. After her death the king privately married Madame de Maintenon and from then until his death her influence was supreme, though she did not hold the rank of queen. Her advice on political matters was seldom given and was always wrong, but her moral influence purified the scandalous court life at Versailles. Her letters portray her life vividly.

Her greatest service to her country was the founding of Saint-Cyr, a school for the education of poor daughters of the nobility. To it she retired, after the king's death, to spend the last years of her life; and in its choir her body is buried.

**MALAY ARCHIPELAGO.** The largest group of islands in the world, lying between southeast Asia and Australia. It includes Sumatra, Java, Borneo, Celebes, New Guinea, the Philippines, and many lesser islands. They are known also as the East Indies. The islands are remarkable for the large number of active and extinct volcanoes to be found upon them. Most of them are exceedingly well watered and support a rich tropical vegetation. The Portuguese were the first to develop the rich island trade in the 16th century, but the Dutch soon gained control, and made the archipelago into one of the world's richest colonial empires. (*See* East Indies.)

**MALAY PENINSULA.** No human dwelling can be found throughout much of the Malay Peninsula, the long finger of land which stretches south and south-east for some 750 miles from the Indo-Chinese peninsula of Asia. Much of it is a rocky wilderness, covered with dense forest and jungle. Roads are few, and the many rivers are the main routes of travel.

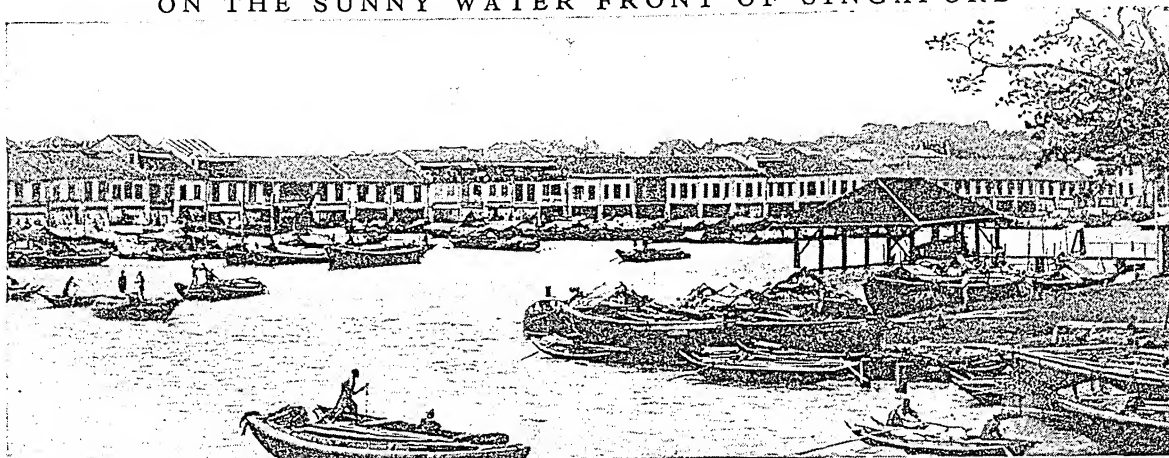
#### THESE MALAY BOYS KNOW WHAT'S GOOD



There is nothing a Malay likes to eat better than a durian, a hard-shelled fruit about the size of a large coconut, and all studded with strong thorny spines which make it look very much like a rolled-up hedgehog. Although the custard-like pulp has a violent odor something like that of decaying onions, it has a deliciously piquant taste of nuts and spices. The seeds too are eaten, after being roasted. Durians grow on lofty evergreen trees from 70 to 80 feet high in the Malay Peninsula.

The rich soil, in one of the hottest and dampest climates in the world, is covered with a bewildering tangle of giant trees, creepers, trailing vines, and undergrowth so dense that even the wild beasts travel only in well-worn paths. Ferns and rank grasses hide the soil. This tangle of vegetation harbors myriads of leeches, centipedes, scorpions, wasps and stinging flies, pythons and cobras, ants and mosquitoes, parakeets and other songless birds of brilliant plumage. Smooth black buffaloes with pointed horns, elephants, and tigers are plentiful. There are black

## ON THE SUNNY WATER FRONT OF SINGAPORE



The open-air, happy-go-lucky life of the Malay Peninsula has somehow breathed its spirit even into this port, the headquarters of British enterprise in the region. You see it reflected in the low, airy houses, and in the curious native craft plying lazily about. An easy life is really necessary, for the humid air has an average temperature for the year of 80 degrees.

leopards and honey-bears, tapirs, and deer, and the rare Malayan antelope; and the lumbering rhinoceros wallows in noisome swamps with the alligator.

Along the swampy banks of the rivers live the strange and mysterious people called the Malays. The typical Malay is short, thick-set, and well built, with straight black hair, a dark brown complexion, thick nose and lips, and bright intelligent eyes. He is suspicious, courageous, and extravagant; a gossip, a Mohammedan and fatalist, and very superstitious. He is conservative, proud, and fond of his country and his people. He is clever but infinitely lazy. He loves power and place; his soul hankers after honors. He plays

at trade sometimes, but almost always fails to make a living at it, because he knows nothing of method or order. His house is untidy, even dirty; but he bathes twice a day and is very fond of gay clothes—especially the soft-toned cotton and silk *sarong* which both men and women wear draped around the waist to make a sort of skirt.

The Malay village is usually a cluster of huts on piles built of bamboo and palm leaves, or sometimes wood and thatch. The houses are never close together, but within sight and call of each other, shaded by tall coconut palms and a few fruit trees—the dark-leaved mangosteen, the mango with its brilliant magenta blossoms, and the durian, that tree of magnificent dimensions which produces the golden spike-studded fruit so liked by the natives. Back of the

*kampong* (inclosure) are fields of rice, irregular golden islands of it running back into little valleys, at the foot, perhaps, of the long mountain chains that rise

range upon range into the heart of the peninsula. This rice, with the fish they are always catching, forms the staple diet.

About two-fifths of the population are Malays; but the bone and sinew of the Malay States are the Chinese, who compose another two-fifths of the total and are the laborers, miners, shopkeepers, and contractors, and contribute almost the whole of the revenue. In the mountains are still found about 20,000 of the aboriginal inhabitants—the woolly-haired negroid Semangs, who support them-

selves by fishing and hunting, and the Sakais, who build their houses in forked trees and formerly obtained all their meat by poisoned darts shot from blowguns. The Tamils, who are recruited from southern India to work on the rubber plantations, make up nearly 15 per cent of the population.

The principal sources of wealth are rubber and tin. Before the outbreak of war with Japan in 1941, Malaya furnished more than half of the world's rubber and nearly two-thirds of its tin. Other export products are copra, palm oil, timber, and canned pineapples. Not enough rice is grown to feed the population, and more than half the supply has to be imported.

## Government and History

Until 1942 the northern portion of the peninsula was held by Thailand,



These brown little Malay children are giving a concert. The one on the left is blowing a toy horn, the one on the right is wailing a high note, while the two in the middle are playing a strange instrument made of vibrating bits of bamboo, thrust upright into a chair-shaped frame. You can imagine the noise they're making!



You can tell by the hair-dress of a Malay woman whether or not she is married. This is the fashion for wives.

and the southern part was controlled by Great Britain through a patchwork of states. The islands of Singapore and Penang, and the districts of Wellesley, Malacca, and Labuan formed a crown colony called the Straits Settlements. The small sultanates of Perak, Selangor, Negri Sembilan, and Pahang were grouped as the Federated Malay States. The governor of the Straits Settlements and a Federal Council of native chiefs and leaders exercised supreme power; the sultan of each state controlled matters involving local custom. The Unfederated Malay States—Johore, Kedah, Perlis, Kelantan, and Trengganu—were governed similarly but as separate units. The capital was Singapore (*see* Singapore). The area under British control was about 53,000 square miles; the population was more than 5,000,000. This government fell before Japanese conquest early in 1942 (*see* World War, Second).

From before the time of Christ, Hindu traders had visited Malaya for spices. In the 13th and 14th centuries of our era, the Mohammedan Malays of Sumatra conquered the peninsula. In order to connect India with the Moluccas or Spice Islands, the Portuguese seized the chief city, Malacca, in 1511. The Dutch ousted them in 1641. Thereafter the Dutch and the English fought occasionally until 1824, when they agreed to divide their colonial interests at the Strait of Malacca.

**MALT.** Barley or other grain that has been artificially germinated or sprouted by moisture and heat is called malt. In the older and simpler method of malting the grain is steeped in cisterns for from 48 to 100 hours at a temperature of about 55° Fahrenheit. It is then spread on a floor in heaps to germinate for several days, and finally it is dried in kilns. In the malting process various ferments or enzymes are produced, especially *diastase*, which has the power of changing starch into sugar (*see* Enzymes).

Malt is largely used in making malted milk, which is a mixture of powdered milk and powdered malt. It is also used in making invalid and baby foods, for the starch of the grain is started toward digestion in the process of malting; some of it is actually changed into sugar and other products soluble in water. A solution of malt products, evaporated to a thick consistency until it looks like brown syrup, is used in bread making. Yeast producers use malt as food for the yeast plants. Much malt is used in brewing beer, which is made from a mixture of malt (chiefly barley malt), various unmalted grains, hops, and water.

**MALTA.** In June 1798 Napoleon Bonaparte, while on his way to Egypt, seized without resistance the small island of Malta, in the Mediterranean Sea. It was then ruled by the Knights of Malta—the last of

the famous Crusading Orders of the Middle Ages. Three months later a British fleet, aided by Maltese rebels, besieged the garrison of French soldiers left behind by Bonaparte. The garrison held out for two years, but finally surrendered. Thus Great Britain came into possession of that important strategic point for naval control of the Mediterranean. But with the development of aerial warfare in the second World War, it lost much of its value as a naval base, since it was subjected to almost constant air bombardment by Axis planes. As an air base, however, it was of great service since it is on the direct route between Sicily and Tripoli which the Axis used to supply its armies in North Africa. Its many caves made excellent shelters for civilians and garrison. Even airplane hangars were built underground.

Inhabited originally by the ancient Mediterranean race, whose great stone monuments are still visible, Malta was colonized by the Phoenicians perhaps 900 years before the Christian era. Then in succession through the centuries came Carthaginians, Romans, Byzantine Greeks, Saracens, Normans, and Spaniards, until the Emperor Charles V in 1530 gave the island to the Knights Hospitallers of St. John. Adopting the title of Knights of Malta, they defended

themselves against Turkish attack in the famous siege of Malta (1565), and maintained their rule until the surrender to Bonaparte in 1798.

Malta lies 58 miles south of Sicily and about 180 miles from the African coast. The island is only 17½ miles long and 8 miles broad, but near by are the smaller islands of Gozo and Comino which make the total area of the British colony 122 square miles.

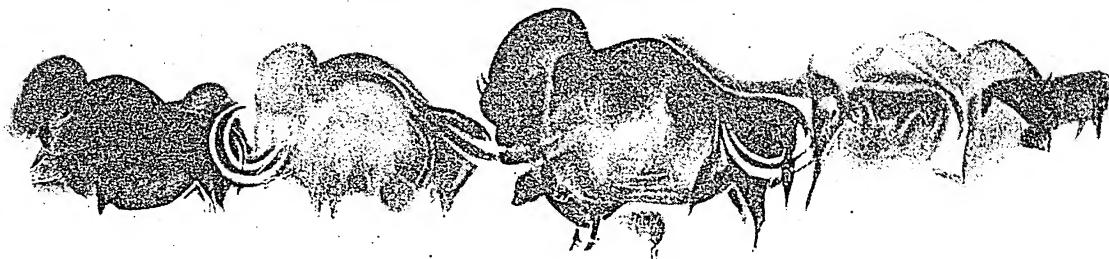
The climate is temperate, and except for occasional outbreaks of Malta fever, due to a germ found in goat's milk, it is healthful. The country people, who cultivate tiny farms terraced up on the hillsides, are largely descendants of the early Phoenicians and speak a language of mixed Phoenician, Arabic, and Latin origin. There is a large admixture of Italians, Greeks, Turks, Jews, Arabs, and other races. English is taught in the schools, but the official language of the law courts is Maltese.

Local government is administered by a British governor and a Council of Government, which is partly elected. The chief products are grains, potatoes, onions and other vegetables, cotton, and fruits; but food has to be imported to supply the needs of the dense population. The capital and chief port is Valletta, with a population of about 25,000. It has a magnificent harbor and contains many interesting buildings, notably the Grand Masters' Palace and St. John's Cathedral. Population of colony, 270,000.



Malay girls marry very young. This little mother is perhaps 17 years old. You can tell that she lives in one of the more civilized parts of Malaysia because the baby is chewing a European "teething ring." Notice the mother's odd sandals, held on by a knob between her toes.

## The PROLOGUE to HISTORY— EARLY MAN'S STRUGGLES and TRIUMPHS



Even before man turned carpenter, herdsman, or farmer, he decorated his caves with works of art like this vivid procession of bison, mammoths, reindeer, and horses, painted in colors on the walls of the cavern of Pont-de-Gaume in France.

MAN. Science can do little more than guess at the period when man first made his appearance on this earth. Bones buried in ancient soils, rude weapons chipped from stone, carved bits of horn and ivory, pictures of animals long since extinct found on the walls of forgotten caves—these provide the material with which scientists are slowly and patiently piecing together a few details of man's early existence.

This much we know, that man existed many thousands of years earlier than was formerly believed. Indeed, it is certain that the prehistoric period of man's existence was vastly longer than the period covered by recorded history. For history, in the restricted sense, did not begin until about 4000 or 3000 B.C., when the art of writing seems first to have appeared; while stone tools or artifacts have been discovered which scientists date back many thousands of years. To this we must add the unnumbered generations that must have elapsed before man learned to make such tools.

### How Scientists Study Ancient Man

Boucher de Perthes, an antiquarian, announced in 1846 that during excavations at Abbeville in northern France he had found ancient flint implements in gravel that contained the bones of elephants, rhinoceroses, and other animals that are no longer found in France. His announcement was scorned and discredited for several years. In 1859 Sir Joseph Prestwich, a qualified English geologist, went to Abbeville to see de Perthes' collection and examine the gravel beds. He came away convinced that the flint implements were the work of man, that they were found in undisturbed ground, that they were associated with the remains of locally extinct animals, and that the period represented preceded historic times. From this time on, scientists began to realize that the appearance of man on earth must be dated to a far older period than that previously accepted.

Various lines of inquiry have now provided evidence of the existence of prehistoric man in an early stage of culture. The scientists who study the ancient objects of the prehistoric period are called archeologists; while those who study man are called anthropologists. To the aid of these comes the geologist, who knows about the formation of the earth and the age of rocks. He can tell the age of relics by the amount of soil that time has deposited on them, or by their place in the rocks. When fossil bones are found, a paleontologist supplies facts about the extinct animals, and a highly skilled anatomist is needed to study the human remains. (See Archeology; Geology.)

### The "Peking Man"

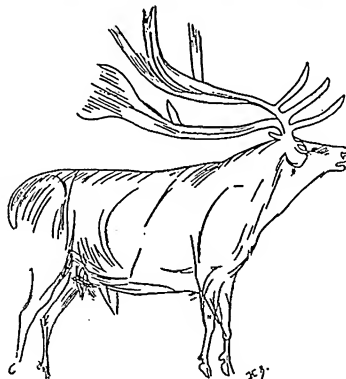
How evidence on early man is pieced together by the coöperation of various scientists, each highly skilled in a special subject, can best be illustrated by the story of the Peking man, known to science as *Sinanthropus pekinensis*. In December 1929, the world was amazed by news flashed from China that an undamaged human skull had been unearthed from cave-deposits near Peking (Peiping)—deposits believed to be 500,000 to 1,000,000 years old!

The discoverer of the site was Dr. J. G. Andersson, a geologist from Sweden. The director of the excavations, and the man who actually found the human remains, was W. C. Pei, a member of the Geological Survey of China. The scientist who studied the remains was Prof. Davidson Black, a Canadian anat-

omist. The archeologist who coöperated in the work was Père Teilhard de Chardin, a Catholic priest, and president of the Geological Society of France.

Besides yielding a perfect brain case, the excavations brought to light human teeth, jawbones, and numerous skull fragments from several individuals. Quantities of associated animal bones, the remains of cave-bears, giant beavers, and primitive deer, made it

### A CAVEMAN'S MASTERPIECE



Some unknown Cro-Magnon, working in the dim firelight, engraved this delicate portrait of a giant stag on the ceiling of his cave-dwelling.



man's first crude attempts at tool making or merely pieces of stone of convenient size which show the effect of use. It is difficult to determine whether the eoliths are really artifacts, or were caused by erosion, rock pressure, the pounding of animal hoofs, or other natural forces. The question of an Eolithic culture, while not improbable, is regarded by many archeologists as not fully proved.

The oldest undoubted human implements are known as paleoliths, and the men who produced them belonged to the Paleolithic (old stone) Age. The older paleoliths are crude in workmanship and are mostly stones of flint, quartz, etc., shaped chiefly as scrapers or knives by flaking with a hammer-stone. The later paleoliths show an improved handicraft. Flaking was done by pressure instead of by blows, and the implements have a neater and more uniform appearance. The men of the later Paleolithic Age likewise produced tools of bone, ivory, and horn. The duration of this period is generally estimated at several hundred thousand years, because paleoliths are found at different depths in the earth, but always in the same order, showing a gradation of cultures from primitive implements to more elaborate, even artistic, craftsmanship.

Next came the Mesolithic Age, a phase of transition between the Paleolithic and the coming of the Neolithic (new stone) Age. In general it is marked by a decline in stone workmanship, but is characterized by pebbles painted with simple designs which may be the beginnings of an alphabet, or more probably magical or religious symbols.

The Neolithic Age was a period of more skilfully fashioned artifacts, when the implements were often polished and made for a wider range of uses. The people of this age also possessed pottery, and used the bow and arrow. The domestication of animals, the cultivation of plants, the invention of the wheel, and the weaving of linen are other revolutionary advances during Neolithic times. It is estimated that in Egypt this age may date back 20,000 years, in Crete 14,000 years, and in western Europe 7,000 or 8,000 years. Most Indians of America, when discovered, were still in the Neolithic stage of development.

In the beginning, so scientists say, primitive man wandered through tropical forests picking up the food provided by nature: nuts, roots, and fruit, or occasional small animals. Some authorities hold, on the basis of anatomical peculiarities, that man's remotest ancestors lived in trees as do some of the apes and monkeys today. They believe, for example, that the ability of a human baby to grip things with its toes is a relic of such an arboreal stage of existence.

Primitive man was at first without tools or weapons except sticks, stones, and bones, used as he found them. He soon learned, however, how to modify these for various purposes. He wore little or no clothing; clothes were not needed in a warm climate. At night he found shelter in a tree or cave, but was ever at the mercy of the huge beasts of prey.

Even before man was able to produce fire at will, he doubtless made use of it. He must have noticed that when the forest was set ablaze by lightning, even the strongest of animals were frightened away, and that this dreadful fire also provided warmth on cool nights. He may have collected some of the burning sticks to carry about with him and so learned to keep the flame alive.

The savage who noticed that by pounding rocks together sparks could be made to ignite dry powdered wood, or he who first started a fire by rubbing dry sticks, made a more momentous discovery. No beast has ever learned how to make fire. With this invention, man made his first great step towards civilization. Fire gave him a weapon of

defense, a source of comfort, and a means for cooking food. Perhaps, one day, when man was eating raw meat or fish, a piece fell into the fire. When he picked it out, more or less roasted, he found that it tasted better than when raw. The accident was so agreeable that he tried it again and found that most food could be improved with fire. So cooking may have begun.

Little is known, but much is surmised, about these early stages of progress. Relics of this period are few. But when man took refuge in caves and rock shelters, and his descendants continued to use the same caves over a period of thousands of years, he unconsciously left his

#### PRIMITIVE POTTERY



Bronze Age people put drinking-cups like the two above in graves with the dead; the bowl below was used for ceremonies at the funeral pyre.

#### A SWISS LAKE-VILLAGE OF 5,000 YEARS AGO



Thousands of wooden piles and other relics found on the bottom of European lakes enable scientists to reconstruct this picture of one of the earliest villages, a Swiss lake dwellers' settlement in the Late Stone Age.

records, chapter by chapter, in the accumulated deposits of rubbish, bones, broken tools, and so on.

The inhabitants of western Europe at the beginning of the fourth glacial period (*see* Ice Age) were a rude but not a brutish people. They were acquainted with the use of fire. They quarried flint and trimmed the pieces to make implements of various sorts. They could kill the smaller animals with their axes, spears, and clubs, and perhaps hunted some of the larger creatures with traps and pitfalls. The dried animal skins were used for clothing; some of the skulls were made into bowls or vessels, the long bones were split, and the marrow extracted for food.

The people of this period already had the beginnings of social life. The way in which skeletons are found grouped gives evidence that they lived in families. And, since the men hunted in groups, there must have been some sort of tribal organization. That these people had certain religious ideas is attested by skeletons found in their original burial places, interred with implements and food, indicating ceremonial burial and belief in a spirit world.

During the period called the Middle Stone Age, man equipped himself with newer and keener tools. He fitted barbed ivory points to his wooden spears and invented a throwing stick to hook around the butt of the spear so as to discharge the weapon with greater speed and power. He also invented the bow and arrow.

Now he was more than a match for the savage cave-bear, the mammoth, and saber-toothed tiger. Now, too, he was assured of abundant food and for the first time gained some leisure for the arts of life.

The women learned to scrape and cure skins until they were soft, and to sew them with bone and ivory needles into more serviceable garments. The men even made bone whistles. An astonishing fact is that these early hunters could carve, and draw, and even paint with skill and artistic feeling.

#### Man Invents Pottery

One of the most important innovations of the Late Stone Age was the invention of pottery. This great discovery enabled man to cross the gap between Savagery and what we call Barbarism. Up to this time there had been no cooking vessels which could withstand the heat of fire. But with pottery came the means of boiling food. This added to man's bill of fare, and the simmering pot became the community center. It was also discovered that stone tools might be ground and thus become sharp axes, chisels, and knives. With these man could fashion more comfortable dwellings, boats, and wooden utensils.

The earliest settlements of the Late Stone Age are to be found in Denmark. Here, along the seacoast, prehistoric man built his wattle huts, erected on a foundation of stone, and constructed of interwoven reeds plastered with clay. In rude boats he ventured out from shore to gather oysters and other shellfish, and on land hunted the wild boar and the wild bull. After feasting by the fireside he would toss aside the shells, bones, and other refuse, which accumulated into extensive heaps. From these "kitchen-middens" archeologists have recovered thousands of stone tools, weapons, fragments of pottery, and other relics of the life of these early people.

The Late Stone Age people of Switzerland were even farther advanced than the prehistoric Norsemen. To make themselves safe from attack, they erected comfortable wooden dwellings out over the water of the Swiss lakes. Traces of no less than 50,000 piles at Wangen bear witness to the great settlement which once existed there. Quantities of wooden furniture, dugouts, implements, and pottery have been recovered from the sites of these "pile-dwellings."

#### Hunters Give Place to Farmers

On the shore, near each village, were the lake dwellers' fields of grain and flax, for these people were already agriculturists. They planted barley, wheat, and millet. They wove flax into garments and fish-nets. Sheep, goats, and oxen were domesticated.

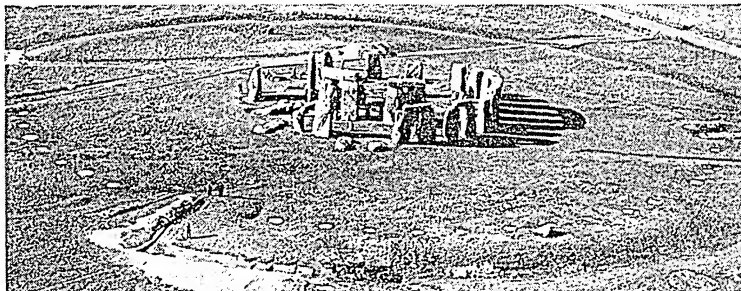
With agriculture and the domestication of animals, there arose two methods of living. Some of the people settled in one place, devoting themselves to agriculture, while others took care of the animals, following the pasture according to the season. The shepherds might go to the north side of the mountains in the summer and to the south in the winter, living on milk and meat from their herds. Such wandering tribes we call nomads. They were very hardy and often

made raids on the farmers. The conflict between nomads and townsmen, begun ages ago, recurs periodically through human history down to the present.

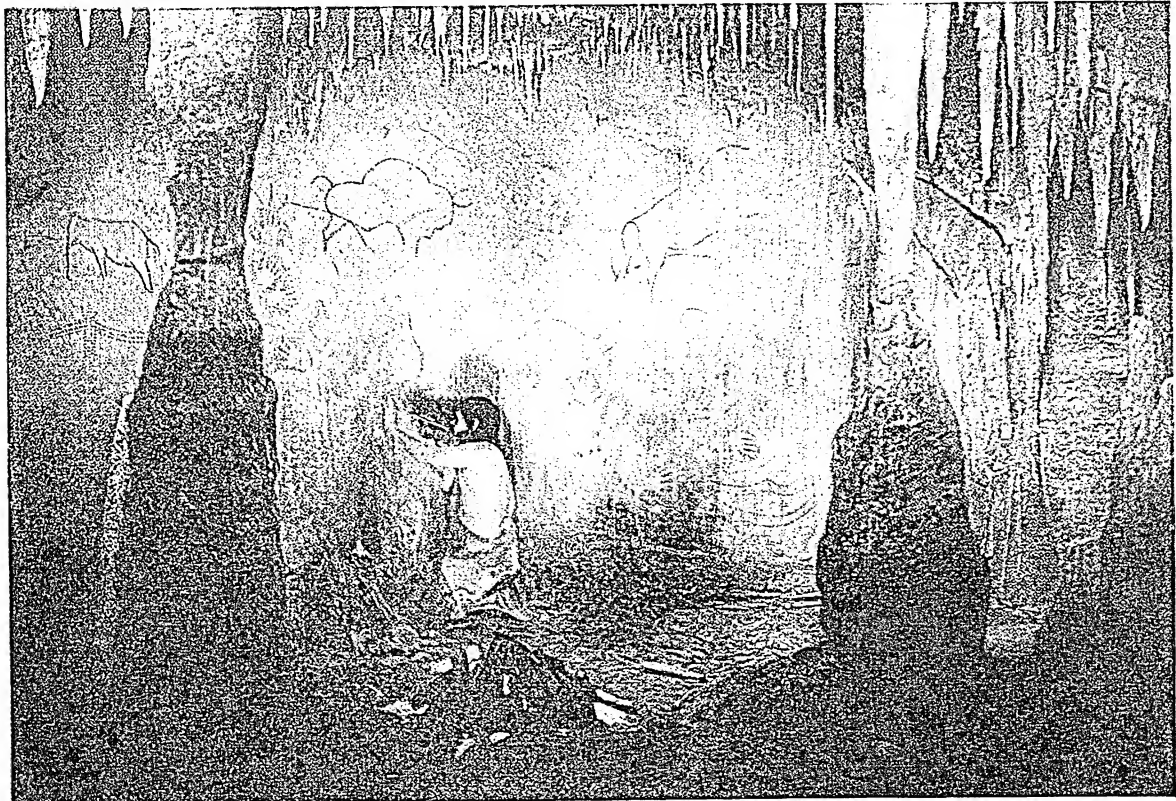
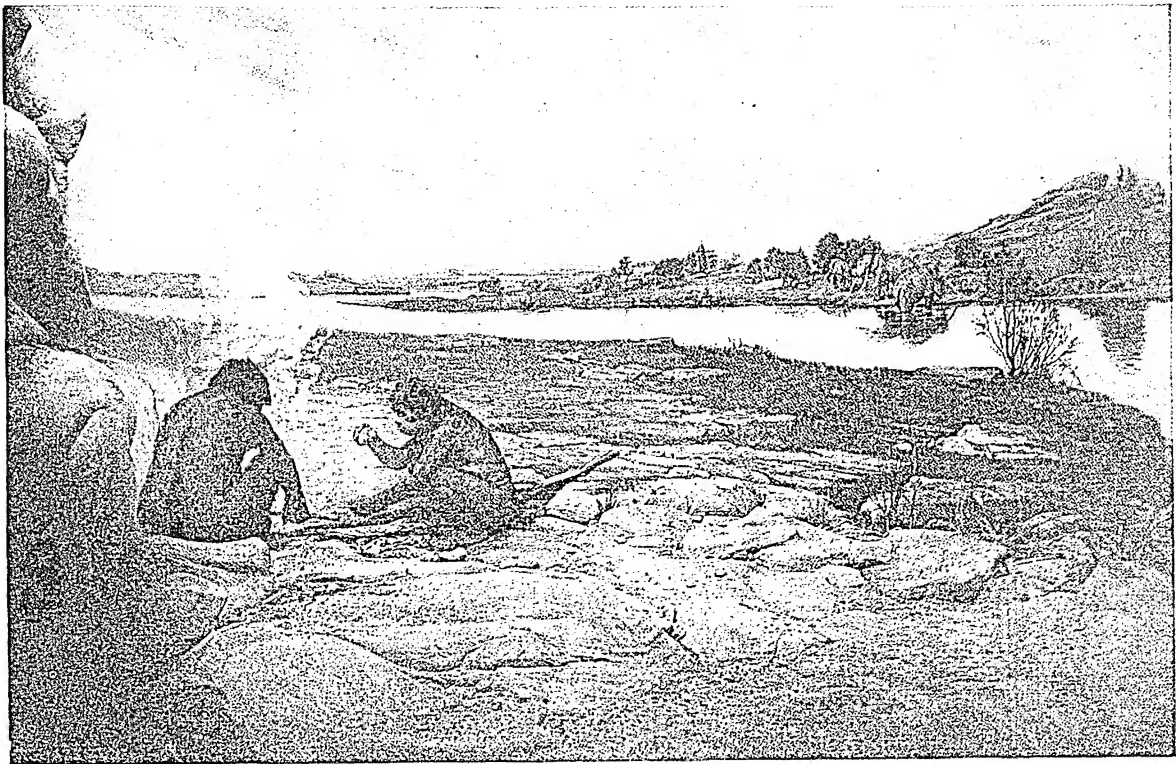
Besides Swiss lake dwellers, there existed elsewhere in Europe other settled communities, the

remains of some of which are still traceable. These people lived in fortified towns and erected near by impressive tombs, built of enormous blocks of rough stone (megaliths). It must have required organization and leadership to raise the mighty megaliths at Stonehenge, England, or the 50,000 piles at Wangen, Switzerland. In these achievements we see the beginnings of government out of which nations have grown.

#### BUILT BY STONE AGE CHIEFTAINS



Stonehenge, in Wiltshire, England, an impressive example of megalithic architecture, consists of massive upright stones set in a circle 100 feet across and enclosing inner stone structures that were probably altars and tombs.



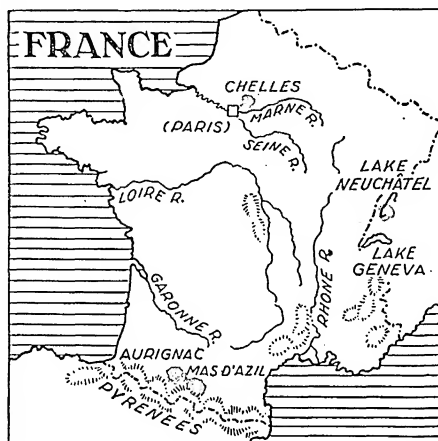
*Direct-color photographs of museum groups*

*See text on following page*

## THE "DAWN MEN" AND THE CAVE DWELLERS



## THE "DAWN MEN" AND THE CAVE DWELLERS



ON the banks of the Marne River in France about 250,000 years ago there lived, so students of man's development tell us, a race of people who looked very much like the figures in the upper picture on the preceding page. Similar types of men were living at the time in other parts of Europe and in Africa and Asia; but, because the first discovered remains of the race were near the town of Chelles, they are called the Chellean people

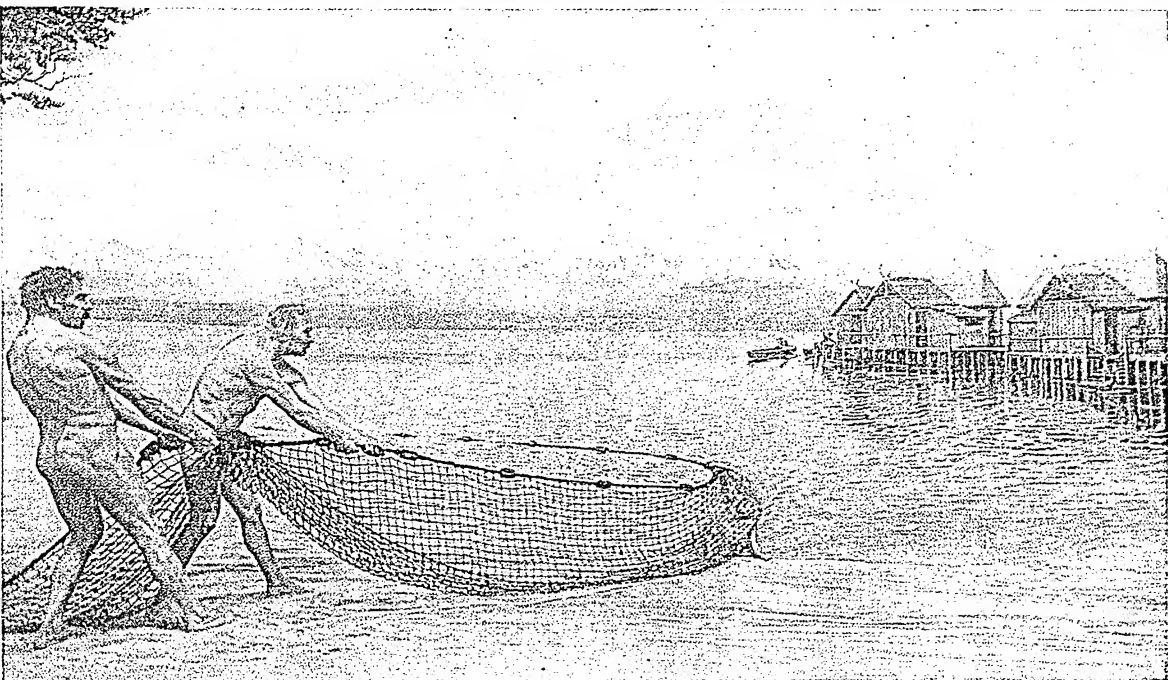
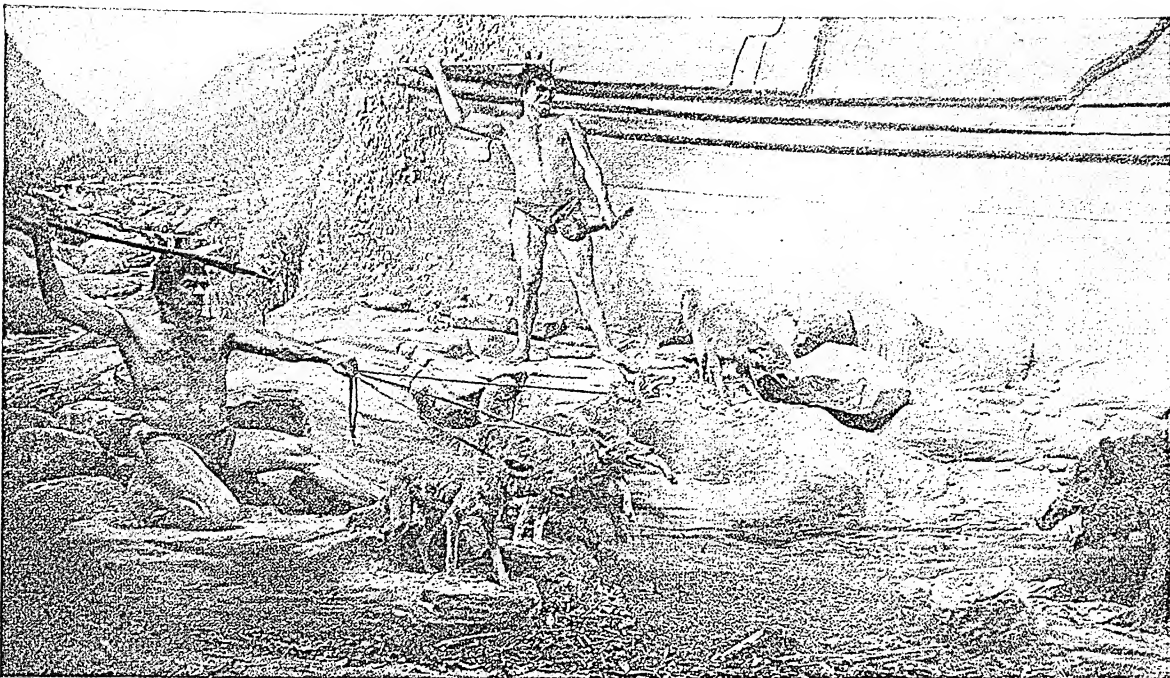
(see map). Popularly they are nicknamed "Dawn Men," or "the First Europeans." We know little about them except that they made roughly shaped hand axes and scrapers of stone, fashioned by chipping as we see one of the men doing in the picture. Almost certainly they knew how to make fire for roasting meat. The climate of northern France at that period was warm, suited to the elephant and hippopotamus, as well as to the elk and the wolf. We imagine that these Chelleans wore little or no clothing and that they slept in the shelter of rocks or trees. No remains have been found of dwellings of any type that date back so far.

The lower picture on the preceding page brings us much nearer our own time and to a far richer store of established facts. For it takes us into the home of a cave dweller of about 35,000 years ago—the Aurignacian period, named from the town of Aurignac near which important remains of the cave dwellers' culture were discovered. The Cro-Magnons, named from a spot further north, were his relatives (see Cave Dwellers).

These men of the Aurignacian period were, so far as we know, the first artists. Our picture exactly reproduces drawings and paintings found on the walls of a French cave. A prehistoric artist is shown at work on one of those strange symbols, the purpose of which is hard to guess. He is blowing red ochre dust through a bone tube to form on the wall an outline of his left hand. Many of the outlines already made, evidently from other hands than his, have missing fingers. Do these mutilations represent some primitive religious ritual? No one knows.

The animals drawn on the wall are chiefly buffaloes and elephants or mammoths. They show that these cave artists had keen eyes for proportion and movement and skilful hands for reproducing, with a few simple lines, what they saw.





*Direct-color photographs of museum groups*

*See text on following page*

## THE TAMERS OF ANIMALS AND THE LAKE DWELLERS

The photographs on this and the preceding color plate were made for Compton's Pictured Encyclopedia by permission of The Field Museum of Natural History, Chicago. The museum exhibits represented are of the diorama type, consisting of life-size figures and other objects in a foreground which blends imperceptibly into a painted background. The general plan of the exhibits was worked out by Henry Field and Berthold Laufer of the museum's scientific staff, with the coöperation of the Abbé Henri Breuil of the Collège de France. The figures are the work of Frederick Blaschke, sculptor, based on descriptions and measurements supplied by the Abbé Breuil, Sir Arthur Keith, and Prof. G. Elliot Smith. Backgrounds by Charles A. Corwin. Color photography by Lee Saylor.

## THE TAMERS OF ANIMALS AND THE LAKE DWELLERS

SOME 12,000 years ago in western Europe there appeared groups of people far inferior to the cave dwellers in art and perhaps in general intelligence, but superior to them in warfare and hunting. These were the Azilians, pictured at the top of the preceding page. The name was given them because remains of their culture were first found at Mas d'Azil in southern France (*see* map opposite picture).

Perhaps their chief advantage lay in the fact that they or their ancestors had begun to tame animals and put them to work. The picture shows us two Azilian hunters who, by the aid of their dogs, have cornered a wild boar and are about to kill it with their flint-tipped spears. For fishing these people fashioned barbed harpoons, and they made necklaces and other decorations of shells and the teeth of deer.

The advent of the Azilians marked the end of the Old Stone Age in Europe. It is impossible to say whether these people exterminated one another in warfare or fell under the domination of more intelligent races with whom they settled down and by whom they were absorbed. But they seem to have disappeared by the time the culture of the New Stone Age was taking shape in Europe.

Most interesting of the people of this New Stone Age are those we call lake dwellers. Numerous remains of their settlements are found along the borders of the Swiss lakes. The lower picture on the preceding page shows a reconstruction of one of their villages on Lake Neuchâtel (*see* map). The wooden piles on which the houses rested have been preserved under water and the lake bottom has yielded up countless other relics.

With the lake dwellers we take a tremendous forward step in the story of primitive men. They far excelled the earlier types in the crafts and in what we would call today domestic science. Most important of all, they had learned the advantages of coöperation by groups of families under a common leadership, the beginnings of settled social organization.

As the picture shows, these people were fishermen. They used nets made from linen cords, fish spears, and hooks. They possessed dugout canoes. They knew how to weave cloth. They raised cattle and cereals. They made household implements of pottery, stone, bone, copper; and, on the very threshold of the historic period, they had learned how to get and use iron.

Their dwellings were one-room structures resting on platforms made of small logs or rough planks covered with earth. The walls were fashioned of woven twigs and rushes and plastered with clay. Fires burned on stone hearths in the center of the floor, the smoke escaping through holes in the thatched roofs. The houses in each group were connected to one another and also to the mainland by small railed bridges.

It is believed that these people built their villages out over the water to protect themselves in their peaceful pursuits from their less civilized neighbors, who may have been wandering hunters. Remains of more than fifty such settlements have been counted on Lake Neuchâtel alone.

After the Stone ages came the Age of Metal. Copper implements and ornaments were apparently the first metal objects to be made. The Age of Copper began in Egypt about 5,000 years ago. This was followed some 1,500 years later by the Age of Bronze. Iron came into use in Europe during the thousand years before the beginning of the Christian era. These metals made a new epoch in the life of humanity, for they gave man new power over the forces of nature. (See also Bronze; Civilization; Stone Age.)

**MAN, ISLE OF.** In the Irish Sea, midway between England and Ireland, lies the Isle of Man, famed for its tailless Manx cats and as the scene of Hall Caine's Manx novels. On its hills and glens are many relics of prehistoric, Celtic, and Norse times. It is part of the United Kingdom, but retains partial home rule under one of the oldest parliaments in the world, the Tynwald Court. The lower house of this is called the House of Keys. More than half the area (220 square miles) is cultivated; oats and turnips are the chief crops. The capital and chief town is Douglas (population, 20,000). Holiday visitors, who come to enjoy the mild climate, are the chief source of income. Population, about 50,000.

**MAN'ATEE.** The "sea cow," as the manatee is sometimes called, is a slow-moving, seal-shaped mammal that lives in shallow salt water, coming to the surface to breathe. Three species are known. One lives on the west coast of tropical Africa, one on the eastern coast of South America, and the third from Yucatan to Florida; it is now rare on the Florida coast. The manatee is 8 to 10 feet long, black, thick-skinned, and almost hairless, with a broad, shovel-like tail. It has only one pair of limbs—its front flippers. It uses these to push seaweed and other water plants toward its

mouth, where the lobed upper lip clutches the food. The mothers guard their single young with great care.

Manatees belong to the order *Sirenia*, which also includes the dugong of the Indian Ocean, the Red Sea, and the Australian coast. Scientific name of the North American manatee, *Manatus latirostris*; South American, *M. americanus*; African, *M. senegalensis*; dugong, *Halicornes dugong*.

**MANCHESTER, ENGLAND.** The city of Manchester, 31 miles east of Liverpool, is the cotton metropolis of the world. It is the hub of the smoky, densely populated, manufacturing district of Lancashire.

The 35-mile Manchester Ship Canal, which connects Manchester with the estuary of the Mersey River, has made it one of England's leading seaports. Not only textiles, but glass, clothing, machinery, railway cars, chemicals, dyes, rubber goods, and other products of an extensive industrial region are exported; and raw cotton, oil, fruit, grain, timber, and other commodities are shipped in from abroad.

The city's leadership in the textile industry can be traced back to the 12th century, when wool farming was established in Lancashire on a large scale. After the introduction of machinery for cotton spinning and weaving in the 18th century, this district naturally became the center of the cotton industry because the rivers furnished power and the damp climate was favorable to cotton spinning. When steam power came in, it had vast coal fields to draw on. With the building of railways, the position of Manchester was threatened, because railway charges and high dock dues ate up the profits. The city therefore made itself a seaport by building its ship canal, 1887-1894.

Manchester has a university, several colleges and libraries, and a cathedral. The city and its suburbs were destructively bombed by the Germans in the second World War. Population, about 765,000.

## A NEW STATE Carved from OLD CHINA

**MANCHUKUO** (*män'-jō'kwō*). This is the new name given to the lands torn from the feeble grasp of China in 1931-1932, when they were made into a separate state. Manchukuo (also spelled Manchoukuo) comprises the former Three Eastern Provinces of China, Jehol (eastern Inner Mongolia), and the

territory between Jehol and the Great Wall. Its heart is the natural region called the Manchurian Plain, which by its natural wealth and its situation offers a tempting prize to neighboring nations. This article deals with its government, its history, and other facts affecting its political existence. For its physical geography, agriculture, and other aspects, see Manchuria.

Manchukuo is about twice as large as the entire Japanese Empire, though its exact area is uncertain.

**Extent.**—North to south, about 1,800 miles; west to east, 900 miles. Area, more than 500,000 square miles; population, about 43,000,000.

Area of Kwantung Leased Territory, controlled by Japan, 1,433 square miles; population, about 1,950,000.

**Physical Features.**—The Manchurian Plain, 137,000 square miles. Mountains: Great Khingans, greatest elevation about 8,000 feet; Little Khingans; Chang Pai Shan, greatest elevation about 8,000 feet; Tienpao Shan. Rivers: Amur (called by the Japanese the Heilung Kiang or Black Dragon River), with its tributaries the Argun and the Ussuri, about 1,500 miles, forming the boundary with Siberia; other rivers, the Sungari, Nonni, Liao, Yalu, and Tumen.

**Products.**—Soy and other beans, kaoliang, millet, peanuts, wheat, corn, rice, hemp, cotton, jute, tobacco; timber, wild tussur silk; furs, hides, bristles; coal, iron, salt, soda, shale oil, petroleum, gold, lead, copper, manganese; bean-cake, bean-oil, flour, pig iron, wood pulp, glass, cement, paper, soap, leather.

**Principal Cities.**—Hsinking (capital, 400,000); Mukden, Dairen, Harbin (over 400,000); Antung, Pulantien, Port Arthur, Fushun, Yingkow (Newchwang), Kirin (over 100,000); Tsitsihar, Hailar.

It is separated from Siberia by the Argun River on the west, the Amur on the north, and the Ussuri as far as Lake Khanka on the east. The Tumen and Yalu rivers divide it from Korea. On the south, the Great Wall, meeting the short Manchurian seacoast, separates it from China. On the west there are few

natural boundaries south of the Argun River; hence frontier "incidents" between Manchukuo and Outer Mongolia are common.

The 43,000,000 (more or less) inhabitants of Manchukuo are mostly Chinese, Mongols, and Manchus. The Chinese are in an overwhelming majority, and the Manchus in a very small minority. No census has ever been taken of the Mongols; their numbers are estimated variously at from one to two millions.

There are also more than one million Koreans, 600,000 Japanese, and fewer than 100,000 of other foreign nationalities. The Chinese and Koreans are mainly laborers and farmers. There are Chinese in business, but large business enterprises are mainly under Japanese control. The Japanese government has repeatedly tried to colonize Japanese farmers in Manchuria, but so far without success, partly because the Japanese peasants do not like to leave home, partly because they fear the harsh climate, and partly because they have a hard time in competition with the frugal Chinese and Koreans.

The "paper constitution" issued in the name of the Emperor of Manchukuo recognizes him as the source of all authority. The hard fact is that the Japanese army, stationed there to guard Kwantung Leased Territory and the railway zone, created Manchukuo and remains the source of all power in it. The offices of commander of the Kwantung army and Japanese ambassador to Manchukuo must always be held by the same person. By mutual agreement Japan is given a free hand in the maintenance of the "national security" of Manchukuo. Every important official in the Manchukuo government has a Japanese adviser. More than half the persons in the Manchukuo government

service are Japanese. The Mongols and the Mongol provinces of East, West, North, and South Hsingan are largely allowed to manage their own affairs.

#### History of Manchukuo and Manchuria

Over the vast Manchurian Plain nomad tribes roamed for ages, every now and then invading China in spite of the Great Wall built to keep them out. One such people, the Manchus, akin to the Mongols but less stubbornly nomadic, in imitation of their civilized Chinese neighbors set up an emperor of their own at Mukden. In 1644 Chinese and Mongol allies helped place the Manchu Emperor on the throne at Peking where his successors remained until 1912 (*see* China).

Manchuria long remained thinly peopled, for the Manchu Emperors used its fighting men to garrison

China and forbade the Chinese to settle there. Yet the prohibition, once or twice relaxed, could not prevent the famine-driven people of North China from spilling over into the good Manchurian lands, until the population became mainly Chinese. In the 20th century Chinese immigration swelled to a flood. But more vigorous countries than China had their eyes fixed hungrily on this rich and undeveloped territory.

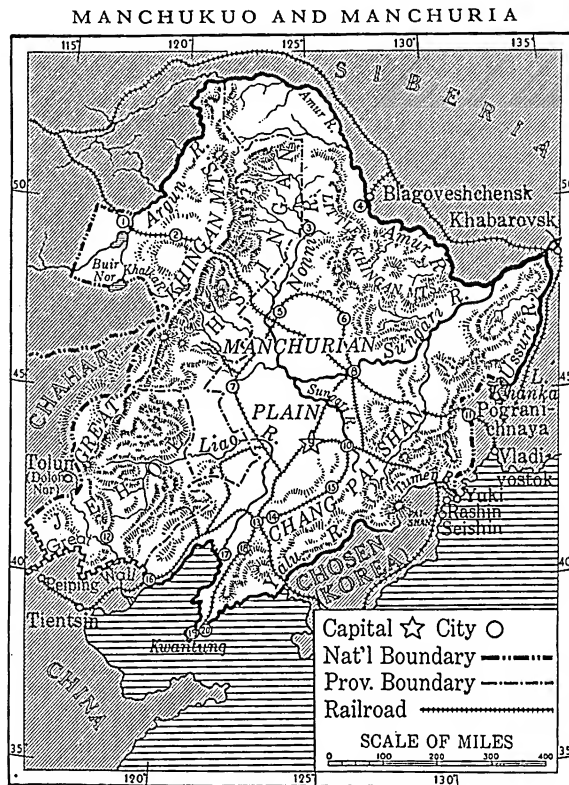
After a brief but decisive war with China (1894-1895), Japan obtained, as part of the spoils, the key to Manchuria. This was the Liaotung peninsula, which Germany, France, and Russia forbade Japan to keep. Russia later obtained the tip of the peninsula on lease, and Japan in 1905 won it back. (*See* Russo-Japanese War.)

When the Chinese Revolution swept the seven-year-old Manchu Emperor from his throne in 1912 to become plain Mr. Henry Pu-yi, China continued to claim dominion over the Three Eastern Provinces and Jehol, but the war lords put in as governors recognized China's authority only when they liked. Extortion, banditry, and debased currency marked their rule.

Meanwhile tensions and rivalries developed over the Manchurian railroads among China, Japan, and Russia. In 1930 China was sole owner of nearly half the railroads in Manchuria, and joint owner

with Russia of about two-thirds of the remainder. Japan owned a little more than one-sixth of the mileage, but that sixth included the strategically dominant and very profitable South Manchuria Railway from Dairen and Port Arthur to Changchun (now Hsinking). Moreover, more than half the Chinese roads had been built with Japanese loans, and the payments were now in default. China had tried to oust Russia from control of the Chinese Eastern Railway crossing Manchuria to Vladivostok, and was now attempting by feeder lines to divert traffic from the South Manchuria Railway to the Chinese Eastern.

The situation was highly dangerous, but by the middle of 1931 the danger seemed almost averted. The governments of Japan and China were both pledged to



Manchukuo is a political state which includes the great Manchurian Plain, shown in the center of this map, and mountain ranges to the east and northeast, the original Manchu domain. This plain is nowhere more than 1,000 feet above sea level. In addition, Manchukuo includes considerable Mongol territory, which corresponds roughly to the provinces of Jehol and Hsingan. The cities, indicated with numbers on the map, from top to bottom are: 1. Manchouli; 2. Hailar; 3. Mergen; 4. Aigun; 5. Tsitsihar; 6. Hailun; 7. Taonan; 8. Harbin; 9. Hsinking, the capital; 10. Kirin; 11. Suifenho, called Pogranichnaya in Russian; 12. Jehol City or Changteh; 13. Mukden; 14. Fushun; 15. Hailung; 16. Shanhaikwan; 17. Newchwang; 18. Anshan; 19. Port Arthur; 20. Dairen.



a peaceful settlement of all their differences. On the eve of the conference to effect this settlement, a bomb went off on the tracks of the South Manchuria Railway—placed there, said the Japanese, by Chinese soldiers. It acted less like a bomb than like an electric push-button, for it did little direct damage but instantly impelled the Japanese Kwantung army into successive occupation of Mukden and other important cities all over Manchuria.

Early in 1932 the foundation of the new government of Manchukuo was announced. The Japanese army played fairy godmother to the new state, next year bestowing Jehol on it.

In 1934 Japanese military authorities announced that Henry Pu-yi had consented to resume the throne of his ancestors as Emperor Kang-teh of "Manchoutikuo." (This is the preferred name of Manchukuo as an empire, though "Manchukuo" is generally used.)

#### Progress Under the New Government

The advance of agriculture, mining, and industry in Manchukuo has been so rapid as to constitute a dilemma for Japan. Japanese farmers complain of the competition of cheap Manchurian crops, and Japanese mining interests demand to be protected from the menace of Manchurian coal.

Industries in Manchukuo are divided by law into

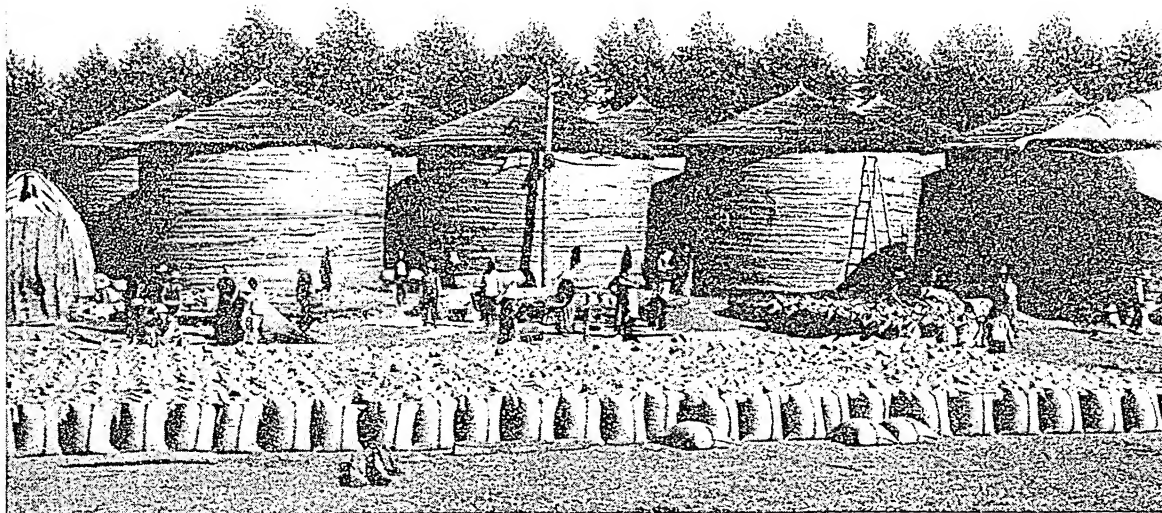
classes. Some are reserved as government monopolies. Others are operated under government license. Some are open to private enterprise.

In 1935 Russia agreed to sell to Manchukuo its interest in the Chinese Eastern Railway, which the Japanese army had already seized for the new state. Japan guaranteed the payment. China's protests that the sale violated its rights went unheeded. Officially the road is now the North Manchuria Railway, and is, like the other state-owned railways, managed by the Japanese-owned South Manchuria Railway.

The government has introduced a more stable and uniform currency, and it has tried consistently, but not always successfully, to repress banditry. Banditry has long been a serious hindrance to legitimate enterprise in Manchuria. Many of the Chinese inhabitants came in as seasonal laborers. When their term of employment was over, they might return to China, or seek to enlist in the armies of the war lord ruling in Manchuria, or—as many of the unemployed were accustomed to do in China—turn bandit.

Not more than 15 per cent of the people have had a primary school education. In 1933 there were about 8,000 schools in all Manchuria, nearly all primary, with a total enrolment of about 450,000 pupils. (See also China; Japan; Mongolia.)

## MODERN MANCHURIA *and its* VAST WEALTH



This picture, taken by the explorer Julien Bryan in Harbin, shows how Manchurians store and ship their most important product, the soy bean. The sacks in the foreground contain beans ready for shipment to plants which make oil and bean cake. The great storage tanks in the background were plaited by hand from straw.

**M**ANCHURIA (*mǎn-chū'ŕi-ā*). The fertile plains and wooded mountains of China's Three Eastern Provinces, now part of the new state of Manchukuo, make up the region which geographers called Manchuria. This vast tract of about a third of a million square miles is as large as Iowa, North and South Dakota, Nebraska, and Minnesota put together.

The great central plain which forms its heart is

much like the northern Middle West of the United States in appearance and climate. It is a rolling, grassy prairie, drained by great rivers. In winter it is intensely cold, and in summer it is intensely hot, with rainfall usually enough for crops except in its arid western portion. And, again like the Middle West of half a century ago, it has become comparatively populous within a few recent decades through mass migra-

tion, and its agricultural and industrial possibilities are being developed by capital supplied by older lands to the east.

This rich region would be a valuable possession to any one of the three neighboring countries—China, Japan, and Russia—with its wealth of farming lands and forests, its coal and iron ore, and its mere geographical position; and it is looked on as a danger by each of the other two that do not possess it.

Turn to the map on page J-186, and you will note the importance of its position. Russia, north of the Argun-Amur River, looks wistfully at ice-free Port Arthur and at the short cut to Vladivostok. China, south of the Great Wall, gazes sadly at what was once a safety valve for the congested millions of North China and the most promising field in the republic for agricultural and industrial progress. Japan, east of Korea and the Japan Sea, looks to the Manchurian mines, forests, and farms to make up for Japanese poverty in raw materials and agricultural land.

#### The Land Itself

Roughly—very roughly—speaking, Manchuria is all Manchukuo north of Jehol. Except for a short stretch of seacoast at the south, the central plain is enclosed by mountains—the Jehol Mountains on the south, the Great Khingans on the west, the Little Khingans on the northeast, and the ranges of which the Chang Pai Shan is the greatest on the east. The plain covers an area of more than 137,000 square miles—nearly equal to the area of Japan Proper—and practically all of it arable, remember, as against the beggarly one-sixth of Japan's surface that can be cultivated.

Many muddy rivers drain the plain. Through North

Manchuria the great Nonni flows south to join the greater Sungari, sometimes called "the Mississippi of Manchuria." This in turn flows northeast through the mountain gates into the Amur, greatest of all. In South Manchuria the greatest river is the Liao, which flows south into the Gulf of Liaotung. All Manchurian rivers freeze over for from four to six months in winter, but many are important highways of water transport so long as they remain open. After they freeze they are used as roads. Some which are unsuited to other uses float great rafts of timber down from the forests.

The more accessible Manchurian forests have been stripped already, but uncounted wealth in pine, larch, fir, spruce, oak, elm, birch, maple, walnut, and other trees still remains on the shaggy mountain sides, especially to the north and east. Along some of the river valleys forests even yet push out well toward the plain. It is estimated that at least 30 per cent of Manchuria is still forested.

The climate is in some respects unique. The temperature range is what you would expect in a continental region hemmed in by mountains. But the prevailing winds are monsoons, blowing cold and dry from Siberia in winter, and warm and moist from the southern and southeastern seas in summer. Therefore there is little snow, and drought may threaten sprouting crops in spring. Rains, occasionally flooding the river valleys, come in summer. At Hsinking, for instance, more than half the year's rain falls in July and August, and less than a quarter from October to May. The north is drier than the south, and the far west is too nearly rainless for any use but pasture.

Along the main line of the South Manchuria Railway, the annual rainfall is about 24 inches; eastward of that line it runs as high as 40 inches, and westward as low as 4 inches.

Though the plain is less than 1,000 feet high at most, and is in the same latitudes as France and Italy, it has long, sub-Arctic winters, when river ice forms six feet thick. Frost prevails in North Manchuria for 225 days of the year, and in South Manchuria for 180 days. But the brief, hot summers make the plain one of the great granaries of the world, since most of the soil is black and rich.

#### Agriculture

Nearly 90 per cent of the population is agricultural. South Manchuria is already populated practically to saturation, mainly with Chinese farmers. North Manchuria still has large undeveloped areas. In all Manchuria, it is estimated, half the arable land or more is still untouched by the plow.

The land is well adapted to large-scale farming with machinery. Yet most of the farms are small, cultivated with

#### MANCHURIA'S MOST IMPORTANT GRAIN



The giant sorghum called kaoliang is the country's most important grain, and ranks next to the soy bean in value. This picture, by Julien Bryan, shows the resemblance between a field of kaoliang and corn. The peasant-type straw hat (left) contrasts oddly with the modern panama.

## IT TAKES THE JOY OUT OF TRAVEL

primitive home-made wooden tools; and the farming population consists overwhelmingly of owners or tenants cultivating small farms, and of hired laborers. Northward the number of large holdings cultivated by hired labor increases.

The Chinese peasant farms much as he did in China. He keeps a few chickens and a pig for his own food and for fertilizer, and a horse or cow to drag his plow if he can afford it; if not, he has his field plowed on contract by a wealthier neighbor. Though too poor to keep many farm animals, such farmers altogether keep 8,000,000 swine.

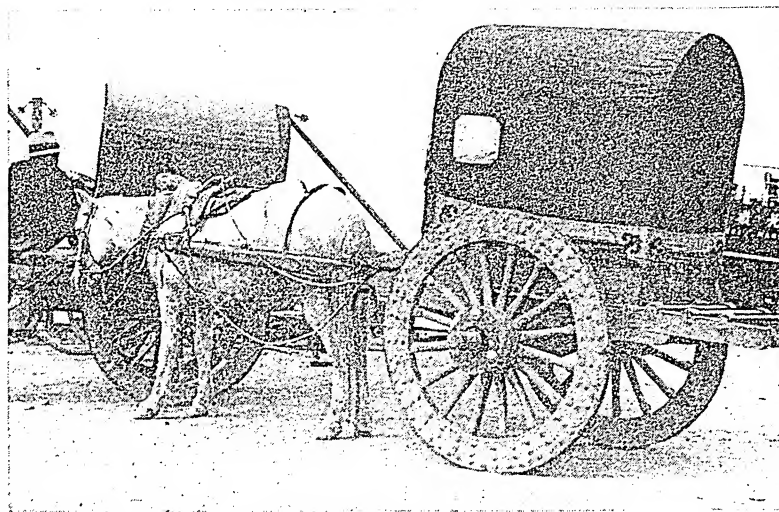
The main cash crop is the soy bean, which rose to prominence after the Chino-Japanese War of 1894-95. The returning Japanese tried bean-cake on their rice fields and found it a good substitute for the more costly fish fertilizer. Thus, an almost worthless by-product of bean-oil immediately became of major importance; and Manchuria grew famous as the world's chief source of soy beans. New uses for the bean were found in industry and agriculture (see Soy Bean). Soy beans are still Manchuria's chief stock in world trade, but the market is being narrowed as other countries begin to raise soy beans and lay high tariffs on imports.

Kaoliang, a giant grain sorghum, is the chief grain crop. The farmers use the pea-sized grains for their own food, feed them to stock, and make a fermented drink from them. With the stalks, they thatch the roofs of their mud huts, make fires, and feed the farm animals. Millet, grown largely in the north, is next to kaoliang in importance. Other crops include wheat, corn, rice, peanuts, cotton, hemp, jute, tobacco, and flax. Some of these are raised only on a small or experimental scale. North Manchuria is comparable to western Canada in fitness for wheat growing, but the wheat raised does not meet domestic needs.

This is the agriculture of the Manchurian Plain. Very different is the pastoral life of the Mongol provinces of Hsingan in the west, which sit astride of the Great Khingans, with one foot in the Manchurian Plain and the other in the eastern end of the Mongolian Plain (see Mongolia). Here the Mongols live mainly by their flocks of sheep and goats and their herds of horses and cattle.

Though Jehol is scarcely Manchurian, it can hardly be considered separately, for its products find outlet through Manchuria. Although Chinese settlers now far outnumber the Mongols here, sheep, goats, horses, and cattle are more extensively kept than among the Chinese population generally.

Hsingan and Jehol are the regions from which come Manchurian wool, horsehides, cowhides, sheepskins,



This is the famous springless cart which is used for transporting passengers in Manchuria and north China. Notice the narrow but heavy iron-studded tires, which cut through mud and dust to the solid ground below. These vehicles are so solidly built that they are almost indestructible; but they are not what we would call comfortable.

lambskins, and goatskins; also furs, including sable, ermine, leopard, lynx, marten, fitch, squirrel, fox, deer, and wolf.

#### Mineral Resources and Manufactures

The most valuable Manchurian mineral is coal, which is widely distributed, though much of it is poor in quality. At Fushun, however, east of Mukden, is a fairly good bituminous coal in the thickest seam in the world, averaging 150 feet and attaining a thickness of 417 feet. The total deposit is estimated to amount to a billion tons. The coal is mined from the largest open cut in the world, and also in the usual way, with deep shafts and horizontal galleries. The Penhsiuh mine not far away has a smaller output of a better coal. Nearly half the coal mined is used in Manchuria, mostly by the iron and steel and other new industries, though the people are learning to use coal instead of kaoliang stalks for fuel. Most of what is exported goes to Japan.

The coal seam is overlain by oil shale, from which oil is extracted at great cost for the use of the Japanese navy. The gasoline obtained as a by-product is marketed in Harbin. Deposits of petroleum have also been found. To aid the oil monopoly formed for its exploitation, severe restrictions have been placed on the foreign oil companies trading in Manchukuo.

Most of the iron ore deposits are in the region around Mukden. The most important mine, with huge deposits of low-grade ore, is at Anshan.

Other mineral resources include limestone, silica, soapstone, salt, soda, lead, copper, and manganese. Alluvial gold is found in the valleys of the Amur, Sungari, Nonni, Yalu, and other rivers.

The most important Manchurian manufacture is based on Manchuria's largest natural product, the soy bean. Primitive little bean-oil presses, worked by hand or by farm animals, still exist throughout the



countryside, but more than half the bean-oil and bean-cake made in Manchuria is produced in the great hydraulic presses at Dairen.

Flour milling, centered at Harbin in the wheat district, and distilling and brewing are the next most important industries. Their products are consumed in the country, but the flour is not sufficient to meet home demands.

The Showa Steel Works near Anshan turns out about a quarter of a million tons of pig iron a year, most of which is shipped to Japan. The difficulty of extraction from the poor ores makes this iron expensive, but the Japanese government wants a supply of iron which cannot be cut off by war.

Minor industries include the manufacture of glass, cement, paper, leather, soap, pulp for paper and rayon, cotton goods, salt, soda, and wild tussur silk.

#### Foreign Trade, Cities, and Communications

The great bulk of Manchuria's foreign trade is with Japan. The remainder goes chiefly to China, Germany, the United States, and Great Britain. The principal exports are soy beans and other beans, bean-cake, coal (all of which go principally to Japan), millet (chiefly to Korea), peanuts (mainly to the Netherlands, Belgium, and the United States), and bean-oil (chiefly to Germany, Great Britain, the Netherlands, the Dutch East Indies, and the United States). Most of the exports to the United States are minor articles of trade like bristles, hemp seed, furs, and skins. Even of these, Japan takes a much longer list. The principal imports are cotton piece goods, wheat flour, iron and steel, vehicles, machinery, and tools, all chiefly from Japan.

More than half of Manchuria's foreign commerce passes through the port of Dairen, which, though not ice-free in winter, is kept open by ice-breakers. At Port Arthur, the only ice-free port, the best part of the harbor is reserved for the Japanese navy. At Hulutao, which is ice-free, a port is being built. Antung, at the mouth of the Yalu, an important log-rafting river, is the largest shipping port for timber. Yingkow, the oldest Manchurian seaport, is the only other port worth mentioning on Manchuria's short coast. Rashin, over the Korean border, which is nearer than Dairen to Japan, is also being developed as a port for Manchurian trade.

Of the cities, Mukden, once the political center of the plain, is the largest. Others are Dairen, new and thoroughly Japanese; Harbin, built by the Russians and having the largest white population in Asia; and

Hsinking (formerly Changchun), the capital, also new and Japanese. Tsitsihar, Hailar, and Manchouli, all on railway lines, are important Mongol centers.

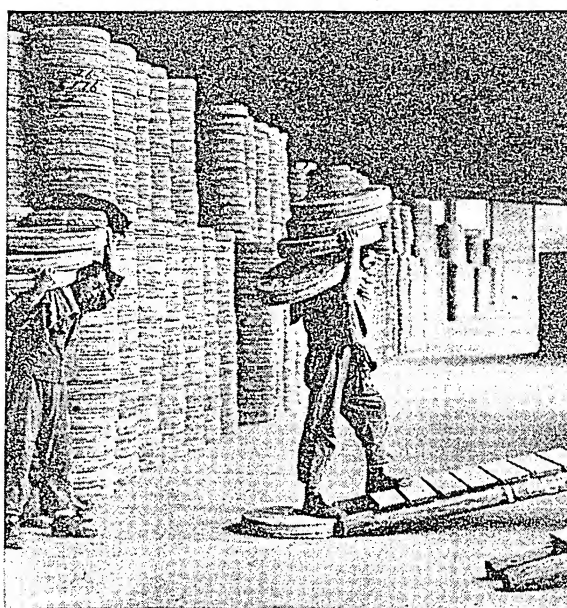
Many of the cities are of very recent and astonishingly rapid growth, made possible by some 6,000 miles of very efficient railways. Of this, more than 700 miles belongs to the South Manchuria Railway, which is a joint enterprise of the Japanese government and Japanese private capital. Japan also controls the strip of land through which the road runs. All but a negligible portion of the remaining mileage belongs to the Manchukuo government, but is operated by the South Manchuria Railway, which is a little empire in itself. Its power

has been compared to that of the old British East India Company; in some ways the comparison scarcely does the South Manchuria Railway justice. It controls the great Fushun coal mines with their overlying oil shales and the Showa Steel Works at Anshan; runs hotels, hospitals, and schools; builds harbors, operates motor bus lines, and conducts agricultural, geologic, and other scientific research.

Most of the roads are scarcely more than rutted tracks, over which the peasants haul their beans and other produce to market in two-wheeled carts drawn by horses or mules. These roads are none too good, even at their best when frozen in winter. During the summer rains they become impassable morasses for weeks at a time. Modern motor highways amount to 3,500 miles, and air routes to a little more. Telephone, telegraph, and radio service connects all the centers of population. (For history and government and for statistics of area and population, see Manchukuo.)

**MANDOLIN.** This string instrument has a deep pear-shaped body like that of the ancient lute, a sounding-board, and a fretted neck. Its tinkling notes are produced by rapidly twanging the strings with a bone or metal plectrum or pick. It is a favorite instrument for accompanying the voice, especially in Spain and Italy. The Neapolitan type, with four double strings, is most commonly used.

LOADING OIL CAKE FOR EXPORT



Each coolie's load, which looks like automobile tires, really is oil cake, left after the soy bean has been squeezed dry of oil in a hydraulic press. The cakes are going aboard a steamer in Dairen for export to Japan. There the cake finds many uses, and after many transformations may appear as American silk hose, for the cake is used to fertilize the mulberry trees which furnish leaves for feeding silkworms.



**MANDRAKE.** In past times people regarded this Old World herb with superstitious awe. Shakespeare and other old writers often refer to its narcotic powers. They also speak of it as shrieking when torn from the ground, because of the fanciful resemblance of its long forked root to the human figure. It was much used as a drug and in love philters.

The mandrake (*Mandragora officinarum*) is native to India and the Far East. It belongs to the poisonous nightshade family (*Solanaceae*). The mandrake of the United States is the may-apple (see May-Apple).

**MANGANESE.** Railroad switch points and frogs would soon be battered out of shape if they were not made of steel alloyed with manganese. This hard gray metal touched with red has the property of making iron and copper exceptionally tough and strong. (See Alloys; Iron and Steel.) In small proportions it is indispensable in making most steel because it removes oxygen and sulphur during the melting. Manganese bronze used for propellers has about  $3\frac{1}{2}$  per cent manganese.

Manganese is introduced into steel by adding an iron alloy, either *ferro-manganese* (about 80 per cent manganese) or *spiegeleisen* (about 20 per cent). These alloys are obtained by smelting iron ore with an ore which is rich in manganese.

The United States normally obtains manganese ore from Russia, West Africa, India, Brazil, and Cuba. The American deposits, although abundant, are mostly low grade. When the United States became involved in war in 1941, it turned to its domestic deposits and built new plants for extracting this important metal from low-grade ores. The metal can be separated by electrolysis from a solution containing ore. In another process most of the impurities are floated off when powdered ore is stirred in a suitable solution.

Manganese has various isotopes, with valences of 2, 3, 4, 6, and 7, and in each it has a different color. Pink, red, black, green, and purple compounds are common. The purple *permanganates* are important disinfecting agents, as in Condy's fluid (sodium permanganate) and potassium permanganate. The dioxide is used in paints, dyes, glass-making, and as a depolarizer in dry cells. The chief ores are *pyrolusite*, *hausmannite*, and *manganese spar*. Manganese is probably an important element in plant growth. The atomic weight is 54.93; the atomic number is 25. The metal was first isolated in 1774.

**MANGO.** One of man's greatest triumphs in improving wild plants is the cultivated mango. In its home in India, this evergreen tree originally had a small plumlike fruit, with a turpentine flavor. Centuries of cultivation and selection have produced a luscious fruit somewhat like a small melon. Many varieties are now grown in Florida, the Caribbean region, and elsewhere in the tropics and subtropics. Green mangoes are used for pickles and preserves, and so the name has come to be applied also to pickles and preserves made from melons, peppers, and cucumbers.

The tree grows from 40 to 90 feet high. Its large glossy leaves make it a beautiful shade tree. In Florida the pinkish-white flowers bloom from December to April. The mango (*Mangifera indica*) belongs to the cashew family or *Anacardiaceae*.

**MANGROVE.** The mangrove is highly adapted to tropical and subtropical seashores, where most trees cannot live because their roots cannot get air from the soil. The mangrove overcomes this difficulty by dropping vinelike roots from its trunk and branches to the surrounding mud. These aerial roots take in air through their pores at every low tide. Seeds do not break away from the tree until they have sent down a root to win a foothold in the mud.

Dense groves of these trees grow on tidal flats in Florida and on most warm, flat seacoasts. The tangle of roots catches rubbish and mud, and thus helps to build new land. The tree usually grows about 20 feet high. Some species have heavy, close-grained wood. The bark is used for tanning and the sweet fruit is good to eat. Scientific name, *Rhizophora mangle*.

**MANILA, PHILIPPINE ISLANDS.** From the moment the Spaniards occupied the site of Manila in 1571, the city was destined to be one of the world's important capitals. It stands on Manila Bay, the finest natural harbor in the Orient. The short Pasig River connects the bay with an inland lake, Laguna de Bay.

The old, walled Spanish city is south of the Pasig; it is now called Intramuros ("within the walls"). In this space, about a mile across, are packed historic churches, convents, and government buildings. To the south, running inward from the bay, is a series of fine parks—the New Luneta, Burnham Green, the Old Luneta, and Wallace Field. The port district is west of Intramuros, behind a breakwater.

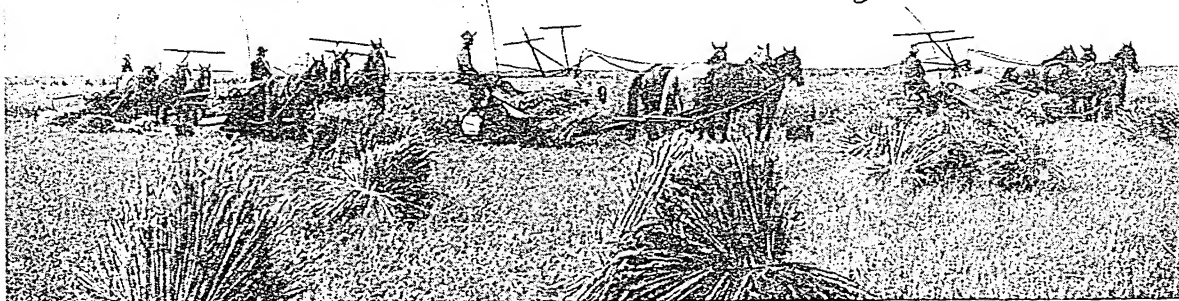
During American occupation after 1898, a modern city grew up north of the Pasig. The old village Binondo became the financial and shopping district. Beyond this, toward the bay, is densely populated Tondo, packed with native thatched houses. Extending far out around the heart of the city are modern residence districts. Here some of the houses are built in old Spanish style, with sliding walls which admit air, and others are of modern concrete construction. Walls usually are unplastered, to minimize damage from earthquakes and the wet climate.

There are many schools and colleges, headed by the University of the Philippines. Aside from being the educational, governmental, and trade center of the Philippines, Manila is important for light manufacturing—tobacco products, cotton textiles and clothing, light metal products, lumber, vehicles, liquor, ice, and manila rope. The city also is a shipbuilding center. About  $7\frac{1}{2}$  miles southwest is Cavite, the naval base. Two small fortified islands, Corregidor and Cavallo, help defend the bay. (See also Philippine Islands; World War, Second.)

White settlement of Manila began in 1571 when Miguel de Legaspi took over a native settlement. It remained the Spanish capital until United States troops entered on Aug. 13, 1898, after the battle of Manila Bay. The Japanese captured it Jan. 2, 1942.

The hot monsoon climate gives a mean temperature of about 80° F., varying only about  $6\frac{1}{2}$  degrees in the course of a year. The annual rainfall is about 80 inches, four-fifths of it coming from June through September. Area of city, about 14 square miles; population, about 625,000.

## Where CANADA GROWS the WORLD'S finest WHEAT



### MANITOBA, CANADA.

The Indians of the prairies believed that the region now included in the province of Manitoba was especially favored by the Great Spirit, and that around the "narrows" of Lake Manitoba his voice might be heard. Therefore, they called the region "Manito-Waban" (Great Spirit's Narrows). The inhabitants of today agree with the redmen in regarding the province as "God's Country," and for proof they point to the broad prairies of the south, covered with waving fields of grain, which form one of the greatest grain regions in the world. These plains were once the bed of a great inland lake, Lake Agassiz, which covered about three-fourths of Manitoba and extended into the United States, and they are composed of rich soil. The soil is especially rich in the valley of the Red River (*see* Red River), and it is here that the best grades of wheat are grown. Oats and barley are the other chief field crops.

On the great farms, most of them from 160 to 640 acres, teams of four, six, or eight horses and powerful tractors plow and harrow the soil and cut the grain at a speed which would astonish the eastern farmer of 60 or 80 acres.

Occasionally the landscape is broken by lakes or a bit of marshland with little ponds of still water. The largest body of water, Lake Winnipeg, is about the size of Lake Erie, and to the west of it lie two large lakes, Lake Manitoba and Lake Winnipegosis.

#### Great Variations in Climate

The province enjoys an invigorating climate, though variations are sudden and of great range. The winters are severe, but the springs are early, and advance rapidly to summer heat. An April that begins with wintry weather may be hot before it is succeeded by May. The great heat of midsummer causes the grain to ripen quickly, and there is little rain at harvest time, so that crops are gathered without dread of wetting. Though there is sometimes an early frost, the abundant average yield of grain more than balances the loss from this danger. The soil and

*Extent.*—North to south, 760 miles; east to west, 495 miles. Area, 246,512 square miles, 26,789 of which are water. Population (1936 census), 711,216.

*Natural Features.*—Great prairies in southwest and south, with broken and hilly land of the Laurentian country in the north and east. Highest elevation, Riding and Duck mountains. Lakes Winnipeg, Winnipegosis, Manitoba, and numerous small lakes. Principal rivers: Red River, Assiniboine, Saskatchewan, and Winnipeg, draining into Lake Winnipeg; Nelson, draining Lake Winnipeg into Hudson Bay; Churchill and Hayes, also emptying into Hudson Bay.

*Products.*—Wheat, oats, barley, rye, potatoes, flax, hay; live stock and dairy products; gold, copper, zinc, silver; building materials (brick, cement, stone, gypsum); lumber; fur and game, fish.

*Cities.*—Winnipeg (capital, 215,814), Brandon (16,461), St. Boniface (16,275).

the climate make possible the production of 45,000,000 bushels a year of "Manitoba hard" spring wheat. Cattle and hog raising, and dairying, are important. Northern Manitoba, bordering on Hudson Bay, is too cold for agriculture, but here

the hunters and trappers find the fur-bearing animals—mink, muskrats, martens, foxes, and others—whose pelts command high prices. Here also, and likewise in the western part of the province, are numerous forests, chiefly of spruce, which provide material for successful lumbering and paper and pulp industries. The government has set aside great areas in southern Manitoba as forest reserves.

Large deposits of high-grade copper, associated with gold, silver, and zinc, have been opened up in the Pas district, at Schist Lake and Flin Flon Lake. The largest gold-mining operations, however, are carried on in central Manitoba. Lakes Manitoba and Winnipeg yield great quantities of fine fish.

#### Railroads of the Province

Most of Manitoba's east and west freight finds its way to Winnipeg, the capital and principal city, and a great railroad center (*see* Winnipeg). The Hudson Bay Railway carries western grain from Winnipeg to Churchill for shipment by Hudson Bay and Hudson Strait to European ports. This line also passes through the Flin Flon and Schist lakes mining districts.

The history of Manitoba is the history of the Hudson's Bay and Northwest companies and of the Canadian Pacific Railway. Until 1870 the land was owned and the people governed by the great fur-trading company (*see* Furs and the Fur Trade). The only important settlement was the Red River Settlement made by Lord Selkirk. Apart from the Indians and half-breeds, most of the men in the region were of hardy Scottish stock.

In 1869 the Hudson's Bay Company transferred its rights to the recently formed Dominion of Canada. The French *métis*, or half-breeds, feared that their language and religion would not be respected, and there followed the Red River Rebellion, known from

the name of its leader as Riel's First Insurrection. The uprising was suppressed, but the problems which caused it have continued to the present time. (See Red River.)

The building of the Canadian Pacific Railway in 1885 brought thousands of settlers from the older sections of Canada, from the United States, and from Europe. Manitoba is still far from being crowded, however, for it covers an area of over 246,000 square miles, more than any state of the United States except Texas. Until 1912, when the province was extended northward to Hudson Bay, its area was only about one-fourth its present extent.

**MANN, HORACE** (1796-1859). The "father of the American public school," Horace Mann was born in a humble farmhouse at Franklin, Mass. His father died when he was 13, leaving him to a youth of work and hardship, with little time for school. But the ambitious lad read every book he found and finally entered Brown University, where he was graduated at the head of his class in 1819. He studied law at Litchfield, Mass., was admitted to the bar in 1823, and practised for 14 years. From 1827 to 1837 he was in the Massachusetts state legislature. He was especially active for educational reforms, and prepared and introduced the act creating the Massachusetts State Board of Education.

In the small district school system of those days there was little provision for children under ten years of age, and most of the smaller communities offered only a few years of training. As secretary of the first board of education, Mann set out to replace the district school organization with the township unit. He knew, however, that any real improvement must begin with the teachers, and partly through his influence the first normal school was established in 1839.

In 1843 Mann spent five months in Europe, studying its schools. On his return he presented his seventh annual report to the board. This antagonized the Boston schoolmasters, who saw Mann's praise of the Prussians' teaching methods as criticism of themselves. Still the report made Mann a national figure. His 12 annual reports and the volumes of his *Common School Journal*, a periodical, circulated widely in the United States and Europe and exerted great influence in raising educational standards (see Education).

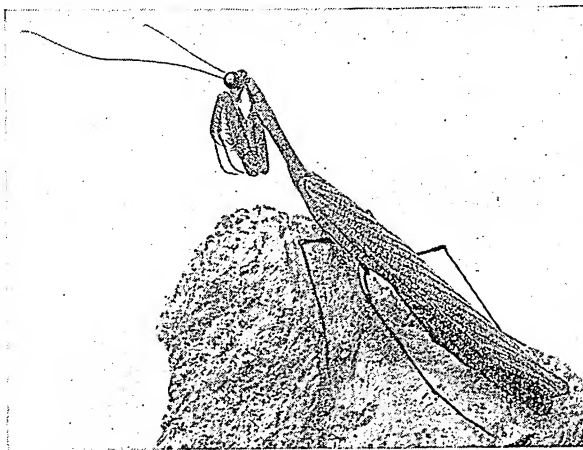
In 1848 Mann was elected to Congress to fill the seat vacated by the death of John Quincy Adams. He was an ardent champion of free speech and labor. In

the face of personal danger he defended negroes in the courts. He broke with Webster over the slavery question, and the Webster faction prevented his renomination in 1850, but Mann ran as an independent and was reelected.

Antioch College at Yellow Springs, Ohio, made him its president in 1853, and there he set out to establish higher education on a coeducational and nonsectarian basis. After six years of labor there, handicapped by lack of financial support, he died on Aug. 2, 1859.

**MANTIS.** Perhaps no living creature conceals behind a pious appearance a more bloodthirsty and malignant disposition than that great hypocrite, the "praying mantis," a relative of the grasshopper and cricket. From the moment of its birth, this insect is a murderer and a cannibal.

THE PRAYING MANTIS AT "PRAYER"



How prim and proper the Mantis looks with its "arms" folded so nicely and its head bowed between them! That's how it got its name—Praying Mantis. Yet it would be nearer the truth to call it the "Preying" Mantis, for this is just a pose that conceals its fierce, bloodthirsty disposition.

With the front part of its body raised up in a prim pose, the hind part swelling out like the flounce of an old-fashioned skirt, and with its big arms folded up so properly beneath its small triangular head, the mantis does indeed look like an old lady at her prayers. But concealed on the inside of those arms are sharp cruel claws, and that head, cocked now to the right, now to the left, holds two large eyes constantly on the lookout for unwary victims. Perhaps a fly ventures too near. Suddenly the

mantis springs; those long scythe-shaped arms shoot out; the fly is caught on their curved barbs, and soon disappears in the mantis' greedy mouth. Fights to the death often take place between two of these insects. The victor dines on the vanquished.

Members of the mantis family are found in the southern United States and Europe and in nearly all tropical countries. The commonest American species, called the "rear-horse" or "mule killer," is of a leaf-green color, and hides in trees and grass. The eggs are laid in tough cases attached to twigs.

Scientific name of mantis family, *Mantidae* (from the Greek *mantis*, "prophet"). Their life history is similar to that of grasshoppers and others of the *Orthoptera* order. More than 800 species of the mantis are known, but of these only about 20 are found in the United States.

**MANUAL ARTS.** Those arts in which the hands are extensively employed are commonly called manual arts (from the Latin word *manus*, meaning "hand"). They include working in wood and metal, book binding, block printing, weaving, sewing, basket making, and similar activities. Such arts as modeling and drawing are usually studied as "fine arts." (See Home Economics; Industries and Industrial Arts.)

## The MAPLES, *Prized for BEAUTY and USEFULNESS*

**M**APLE. Its thick, spreading foliage, which casts a cool shade in summer, and its brilliant coloring in autumn, make the maple one of the most popular trees for parks and streets. It is also a valuable forest tree, especially the sugar maple, which is the source not only of maple sugar, but of the most highly prized maple wood used for furniture and building.

Stalwart and handsome, the maple is easily recognized. It is a symmetrical, wide-spreading tree with a massive, domelike crown of extremely thick foliage. It is one of the relatively few trees with opposite branches, and both branches and twigs usually point upward. The leaf is broad, deeply indented, and varies in length in different species from two to five inches. The fruits are thin, paper-like wings, or keys, each bearing a seed at one end. They grow in pairs.

There are about 100 species of maple, all native to the north temperate zone. More than a dozen of them are native to

North America. Among the most common species are the sugar, hard, or rock maple; the silver or soft maple; the red, scarlet, or swamp maple; the Norway maple; and the box elder, or ash-leaved maple. In the United States the maple family ranks third in commercial hard woods. Canada has adopted the leaf of this popular tree as its national emblem, and its national song is entitled 'The Maple Leaf Forever.'

Although all of the maples have sweet sap, the sugar or rock maple is the source of practically all the maple syrup and sugar that is marketed. It is a tall, vigorous tree that grows to a height of from 70 to 120 feet. Its range is wide—from Newfoundland to Manitoba and south along the Appalachians to Georgia and eastern Louisiana. Sugar production, however, is commercially important only in northeastern United States and the neighboring parts of Canada, because the weather in the spring must be alternately freezing and thawing for a good run of sap. Continued cold or warm weather halts the sap flow. Sugar maples grow slowly and they are seldom good sap producers before they are 40 years old. They yield

the greatest amount after they are 80. The sap begins to run in very early spring and flows for about a month. Each tree produces, on the average, about 10 gallons of sap. Boiled down, this yields about a quarter of a gallon of syrup, or two pounds of sugar.

The sugar maple also has the finest wood for manufacturing purposes. This tough, hard, close-grained wood is widely used in the manufacture of high-grade furniture, flooring, building interiors, aircraft and

other vehicle construction, shoe lasts, and agricultural implements. The ash is rich in potash and is used for fertilizer. Gnarled sugar maples, called "bird's-eye" or "curly" maple, are prized because they can be cut into a handsome veneer for furniture. The black maple, which flourishes near streams and in river bottoms, is a variety of the sugar maple. It also is tapped for its abundant sugar sap, and its wood is similar to that of the sugar maple.

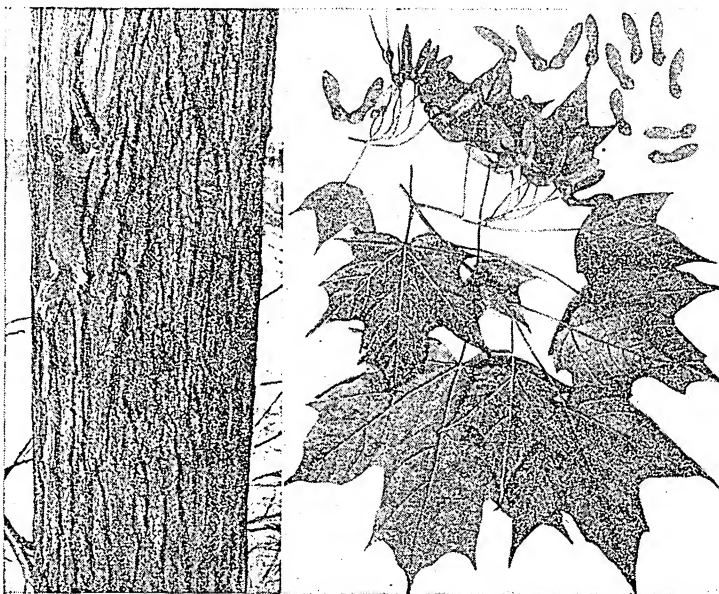
The silver maple, which thrives in moist lands, is popular as a shade tree, because of its rapid growth. Its usual height is about 50 feet, but it often grows to 100 feet. The branches are long and gracefully drooping, with leaves that are pale green above and silvery-white beneath. The soft wood is used for furniture, veneer, and box boards. Another favorite ornamental tree is the box elder or ash-leaved maple, one of the smaller species. It is the only American maple with compound leaves.

The red, scarlet, or swamp maple, a medium-sized species, is one of the most beautiful of all trees in early spring. Before its leaves come out, the tree puts forth clusters of crimson blossoms. Throughout the summer the leaves are a filmy green. At the first hint of autumn they flame into crimson and gold.

The Norway maple has become widely popular in the United States as a shade tree in cities. Extremely hardy, it grows well even with such handicaps as heat, smoke, and hard pavements. Other imported maples are the sycamore maple—an important hard wood in Europe, the European field maple, and the decorative Japanese maples.

Scientific name of sugar maple, *Acer saccharum*; of silver maple, *Acer saccharinum*; of red maple, *Acer rubrum*; of box elder, *Acer negundo*.

THE SUGAR MAPLE, CHIEF OF THE MAPLE FAMILY



The sturdy trunk has a smooth gray bark when it is young, but the bark becomes rough and scaly as the tree ages. The leaves are simple, with three, five, or seven sharply pointed lobes. The winged seeds are called samaras, or keys. Notice the squirrel scampering up the trunk of the tree.



## Making Syrup and Sugar from Maple Trees

OUT OF the white, hard months of the Vermont winter there suddenly comes a promise of relenting. A night along toward mid-March is starlit and brittle with cold. The veil of the Milky Way lies sharp and clear across the sky and the farmer can see his breath pluming out for several feet. But the next morning, after chores and before breakfast, he stops outside his house and looks about him. The deep-packed snow is beginning to thaw. His breath hardly shows at all and the sun is warm on the back of his hand. But there is something else too. As he goes in to his place at the head of the breakfast table, he informs the family that he "calculates the sap will run today."

He does not know *how* he knows, but he is very sure. The sap in the maple trees might have started to rise as early as the last week in February or as late as the first week in April. No outward signs are visible—no budding or any sign of greenness. And yet he knows when the time comes. His forefathers on this place knew also. Forty years between the planting of maple trees and the first harvesting of the sap is a long time in which to study—with another 40 years before the trees produce their maximum best.

The Indians knew the secret first and so the whiteman learned. On old trees you still can see the scars made by tomahawks, then those made by early whites—holes bored with an inch-and-a-quarter auger. Compare those with the half-inch drill holes of today. For the sugar maple is a long-lived tree. It is said that trees planted by the Pilgrims in 1620 are still giving sap.

### How the Trees Are Tapped

Paths are beaten through the snow into the woods. The farmer and his helpers drill holes two inches deep into the trees about waist-high and slanting upward—one to three holes, depending on the size and sturdiness of each tree. Spouts are driven into the holes. Some farmers have a pipe-line system from the trees to the sugar house. Most farmers, however, hang pails on the spouts. The pails, usually of metal for ease in cleaning, are covered to keep out twigs and rain. The sap runs swiftly or slowly, according to weather conditions, and the quan-

tity a tree will give depends on the amount of sunlight that reached the leaves the previous year. Prolonged cold stops the flow. Continuous warm weather—the kind that brings out the buds on the tree—ends sap-taking for the year, for "buddy" sap makes poor syrup. Crisp, cold nights, warm sunshiny days with alternate thaws and freezes make ideal "sugar weather." During the average month-long season, the sap will run only about half the days. "Good runs" may occur on as few as two days; seldom more than five.

From the buckets the sweet and colorless sap is collected into horse-drawn gathering tanks on sleds. In the small groves the sledge team usually hauls the sap directly to the camp, where it is boiled down over a log fire. The sap is ladled from one kettle to another until in the last one it is thick enough for syrup. In the larger groves, which may have as many as 5,000 trees, no boiling is done at camp. The sap is hauled to a "sugar house"—a low shed, with a towering chimney to give draft for the boiling fires. The sap is poured into long evaporators set on an "arch," a narrow brick or iron furnace.

### Good Syrup Needs Careful Cooking

Few farm tasks require more patience and watchful care than the preparation of high-grade maple products. To produce the prized golden-colored syrup of smooth, mellow flavor, only a little of the sap is boiled in the evaporator at a time. Constant watch is kept with thermometer and hydrometer to test the thickness of the syrup, and all impurities are strained out through a felt matting. The syrup is canned quickly so that it will not become soured by bacteria growth. Or, if it has been boiled down to sugar, it is put into tin or wooden molds and packed carefully for shipment. Candy manufacturers use a large amount of maple sugar, but most of it is used to flavor and sweeten tobacco products.

Maple sugar and maple syrup are exclusively North American products. In the United States the output comes chiefly from Vermont, New York, Ohio, Pennsylvania, Michigan, and New Hampshire, although many other states produce small quantities. The southern and eastern parts of Quebec are the main producing areas of Canada.

WHEN THE SAP BEGINS TO "RUN"



It is the first day of the tapping season in this maple grove. With brace and bit the men are boring holes to let out the sap and hanging buckets to the trees to catch the flow.

**MAPS.** Men have made and used maps since the dawn of history. This is because a map can give useful and interesting information that cannot be told nearly so well in words. A map is, in fact, a special kind of picture that speaks a picture language of its own.

To learn this language so that we can "read" all of the simpler types of maps is easy with a little practice. This is fortunate, since the ability to read maps is an essential skill in modern life. It is a necessity in school years, not merely in the study of geography, but also for a clear understanding of plant and animal life, history, current events, and many other fields. Because it helps us so much in other studies, map reading is now classified by educators as one of the "tool subjects," along with reading, writing, and arithmetic.

Outside of schools, maps are playing an ever-increasing rôle. Almost every issue of current newspapers and magazines contains one or more maps. Road maps guide us on vacation trips. Historical maps illustrate countless books. Articles and pamphlets on resources, trade, industries, and international relations are commonly pointed up with special maps. Exceptional skill in the use of maps is required in many trades and professions, culminating in the science of navigation by sea and air.

To learn to use maps intelligently, we must first understand how they are made. It is easy to show the plan of the earth on a globe, but it is difficult to do so on a flat surface. You will see why if you cut the skin of an orange into half-separated strips and remove them as a single piece. The result when flattened out will resemble the drawing in Fig. 1.

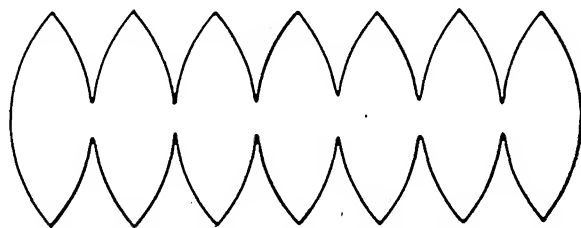


Fig. 1. The "Orange Peel" Problem

The nearest to a flat surface you could get by peeling off the surface of a geography globe would be a shape something like this, as you can find out by trying it on an orange.

Every boy discovers this difficulty of adjusting a flat surface to a sphere when he tries to cover a ball with a piece of leather; it can only be done by cutting the leather into specially shaped pieces and sewing them together.

But it is possible to cover the surface of a "cone" with a continuous piece of paper, or other material, and have it lie flat. One way of "projecting" maps, therefore, is to imagine the earth composed of two cones with the Equator as their common base. In this way we prepare what is called a "conic projection," which is fairly satisfactory for single states and countries, and other small sections of the globe's surface. The accompanying diagrams (Figs. 2 and 3)

show how a conic projection is made. Such a projection is easily recognizable by the fact that the meridians are all straight lines diverging from a

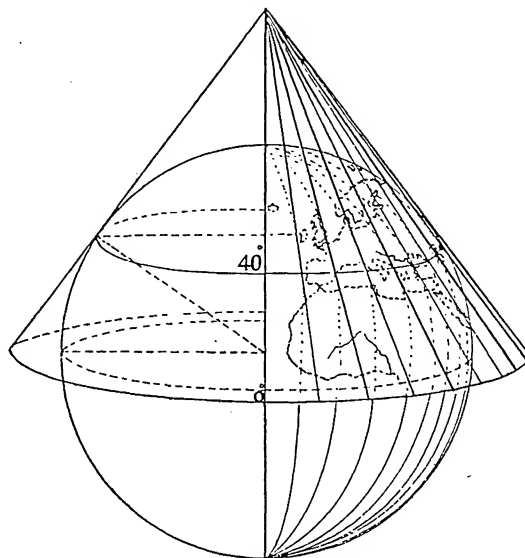


Fig. 2. How a Conic Projection is Made

common center, and the parallels are arcs of concentric circles. In what is called a "polyconic" projection the meridians, however, are slightly curved, and the parallels are not always concentric arcs.

Imagine a cone of paper fitted over the top of a globe touching the surface at (say) the 40th parallel of north latitude; this is then the "standard" parallel. Meridians are drawn at equal intervals on the paper as straight lines from the apex of the cone to its base, and the parallels appear as concentric circles drawn with the apex as a center.

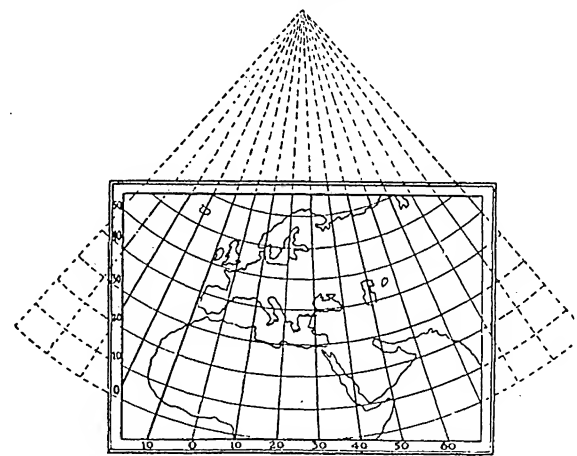


Fig. 3. The Completed Conic Projection

When the paper cone is unrolled it appears as above. In all conic projections the scale along every meridian and along the standard parallel is correct; but north and south of the standard parallel latitude and longitude are progressively distorted.

For showing the whole surface of the globe on a single map, what is called "Mercator's projection" is frequently used. In making this projection the globe is imagined as inclosed in a paper cylinder (Fig. 4). If the cylinder were of the same height as the globe, the

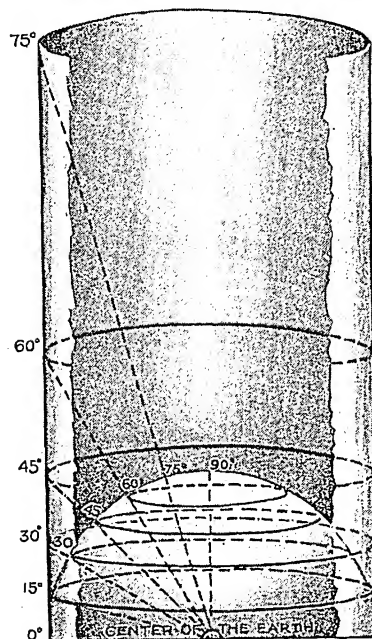


Fig. 4. Mercator's Principle

east-and-west distances near the poles would be enormously exaggerated, while the north-and-south distances would be practically correct. To remedy this distortion of shape, a corresponding distortion north and south is introduced. Projection lines are drawn from the center of the globe at regular intervals of latitude and continued until they meet the surface of the cylinder.

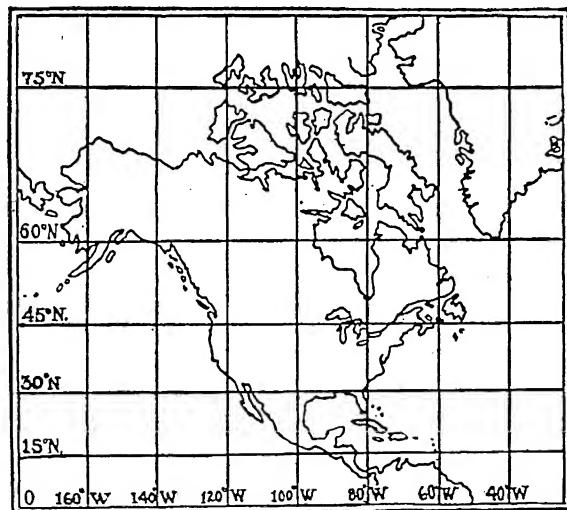


Fig. 5. Mercator's Projection Completed

Thus the distance between the 60th and 75th parallels of latitude becomes enormously greater than that between the Equator and the 15th parallel, and the poles cannot be shown at all on these maps. Figure 4 shows how the Mercator's projection is formed, and Figure 5 what it looks like when it is completed. In spite of its great exaggeration of areas toward the top and bottom of the map, this projection is

very useful, especially for sailing charts. All meridians and parallels are straight lines crossing at right angles, and a compass course between any two points is the straight line connecting them.

There are many other types of map projections, but these are among the simplest. No map, it should

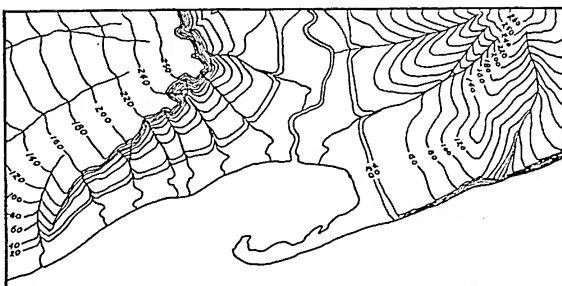


Fig. 6. Contour Map of a Coast Line

be remembered, can ever represent the surface of the earth as accurately as a globe. If you will examine a map of North America on a conic projection, and then on a Mercator's projection, you will see a very great difference in apparent size and shape. And yet each is an accurate representation according to its system of projection.

Maps which show the character of the surface of the ground are of several kinds known as "relief"

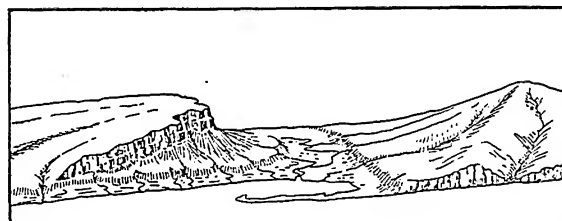


Fig. 7. Profile Sketch from Contour Map

maps, "topographic" maps, "contour" maps, etc. An example of a contour map is given in Fig. 6. Such maps show the detail of the earth's surface by indicating with contour lines where planes of regularly increasing altitude would strike the surface of the ground. In this case the planes are 20 feet apart. In other words, imagine that the ocean has risen 20 feet at a time, and that after each rise an outline has been drawn around the parts of the land which were still above the surface. You can see how, in this way, every rise and depression of the surface would be indicated. Lines very close together indicate a sharp rise, while those further apart show a gradual slope. In Fig. 7 we see how a profile sketch can be made from the information contained on the contour map in Fig. 6.

**MARAT** (*mā-rā*'), JEAN PAUL (1743-1793). The name of Marat recalls the worst excesses of the French Revolution, for his pen and his voice were ever active in instigating violence and denouncing moderation. He was a chief agent in arousing the Paris mobs to the

## CUTTING THE MARBLE FROM ITS ANCIENT BED



Here is one of the New England quarries from which we obtain much of the marble for our buildings and statues. The stone is cut in great blocks, and steam engines and tackles then hoist it onto railway cars to be hauled away.

massacres of September 1792, and during the trial of Louis XVI he was urgent for the king's immediate execution. Reproached in the Convention for demanding in his journal the death of 270,000 adherents of the old régime, he defended this demand and declared that unless it was granted he would ask a yet greater sacrifice.

We must not forget, however, that Marat was animated by a sincere pity for the sufferings of the common people, and that the persecutions which resulted from his incessant attacks on all in power had embittered him.

Before the Revolution Marat was a physician and scientist of considerable repute. From the outset of the struggle his passion and vehemence made him a foremost figure among the revolutionary leaders. He founded a journal, *L'Ami du Peuple* ("The Friend of the People"), in which he assailed the moderates with such violence that he was forced at times to hide in the sewers of Paris. In 1792 he became a member of the Commune, and the following year he played a leading part in bringing about the downfall of the Girondists. In the height of his triumph he perished, stabbed in his own house by Charlotte Corday, a Girondist sympathizer.

**MARATHON.** On the little plain of Marathon, in Greece, about 25 miles northeast of Athens, may be seen a great mound nearly 50 feet high. Beneath it lie the remains of 192 gallant Athenians who gave their lives, 24 centuries ago (490 B.C.), to preserve their city and all Greece from conquest by the Persian hordes of Darius the Great. The mound raised by their grateful fellow-citizens to receive their bodies

and commemorate their heroism was excavated in 1890, and the sacred relics were brought to light for the first time since the day of their glorious victory. (For the story of the battle see *Persian Wars*.)

The famous "Marathon race" (covering 26 miles and 385 yards, the distance from Marathon to Athens) was instituted in the modern Olympic Games held at Athens in 1896. It was founded in honor of the runner Pheidippides, who brought news of the victory to Athens and died shouting, "Rejoice! We conquer!" The term has since been applied to other long distance races.

**MARBLE.** We owe most of our supply of the beautiful crystalline rock called marble to countless millions of tiny sea animals, whose mineral remains have been pressed together into this form. Limestone is formed the same way; indeed, marble is merely limestone which has been altered, or "metamorphosed," by the action of heat and pressure (see *Geology; Limestone*).

The color of marble depends on its purity, the whitest marble being nearly pure calcium carbonate. The "alabaster" of the ancients was a fine, translucent kind, from which exquisite ornaments were made. Oxides of iron, silicates, and other impurities give the beautiful colorings of the different varieties. Connemara or serpentine marble is mixed with the mineral serpentine, a magnesium silicate often colored green. Onyx marble (which must not be confused with true onyx, a variety of agate) is formed by the precipitation of calcium carbonate from solution, usually from the waters of springs; its colors are various, white, yellow, and green being common.



Marble has always been a favorite material with sculptors and architects because of its beauty and the ease with which it is worked. The exquisite statues of the Greeks were made from pure white "Parian marble" quarried on the island of Paros, in the Aegean. Today the marble most used by sculptors still comes from the famous quarries of Carrara, in northern Italy, which furnished the material for the Pantheon at Rome and have been worked steadily ever since.

The United States has large supplies of marble of many varieties. Vermont and Tennessee lead in production. Other important producing states are Georgia, Missouri, Alabama, New York, California, Arkansas, and Massachusetts. Marble is used for monuments, buildings, statues, bathroom and lavatory equipment, wainscotings, tops of tables, floor tiles, and for many other purposes. Since it resists fire better than granite, it is much used in fireproof buildings. (See also Quarrying.)

**MARCH.** Before January and February were introduced into the calendar the Roman year had only ten months, and March, named in honor of the god Mars, was the first instead of the third month. In the Middle Ages the year was usually reckoned as beginning March 25, and England did not abandon this practice until 1752. The last three days of March were once supposed to have been borrowed from April, and according to an old proverb they are

always stormy. The vernal equinox (see Equinox and Solstice) falls on March 21, so the month is part winter and part spring. According to the old saying, if it "comes in like a lion it will go out like a lamb."

**MARCH, PEYTON CONWAY** (born 1864). "Aggressiveness, initiative, and organizing power" are the qualities which raised General March to the position of chief of staff of the United States Army during the first World War. He was promoted to this office after serving as chief of artillery under General Pershing in France during the early months of American participation in the war.

After graduating from Lafayette College in Pennsylvania, March became an honor graduate of West Point in 1888. At the end of ten years of service he was in command of the famous Astor Battery in the Philippine Islands during the Spanish-American War. During the next three years he held various military and civil positions of importance in the islands. In the Russo-Japanese War he was an official observer with the Japanese army for the United States. He served as a member of the General Staff, 1903-07, and attained the rank of colonel in 1916. When the United States entered the World War in 1917 he was on duty on the Mexican Border, and was promoted to brigadier general, and shortly afterward major general (Sept. 1917). In May 1918, Congress raised him to the rank of general. He was retired from active duty at his own request in 1921.

## *The MAN who FIRST MASTERED "WIRELESS"*

*How the Unseen Waves of Electricity were Harnessed—The First Radio Message across the Atlantic—Saving Ships at Sea*

**MARCO'NI, GUGLIELMO** (1874-1937). In a dusty little room of an old Newfoundland barracks, on Dec. 12, 1901, Guglielmo Marconi sat among some queer-looking instruments, his eyes sparkling, nerves taut, a telephone headpiece clamped to his ears. Outside a violent north Atlantic storm whipped the sea into huge frothy waves. Several men stood by watching Marconi. They had faith in him, even though his purpose seemed fantastically impossible. He was trying to receive a telegraphic signal out of thin air from across the Atlantic, and surely he could not have picked a worse day!

Everyone was tense, silent. For a time nothing happened. Then suddenly there came a sharp tap. Marconi raised his hand, listened a moment, then handed the headphones to his assistants that they might hear also the distinct clicks of the letter "S." These signals were being sent from Poldhu on the English coast, 2,000 miles away. Wireless communication across an ocean was an accomplished fact, and Marconi's theory that the curvature of the earth would not impede the progress of the wireless waves was definitely proved.

The inventor was happy, but not surprised. The

marvelous accomplishment was merely the fulfilment of theories he had held since 1895, when he began experiments in methods of sending and receiving the electrical impulses known as Hertzian waves. These theories were not entirely new with Marconi. Other men had worked out the basic scientific principles on which wireless telegraphy rests, but it was Marconi who saw its enormous possibilities and devised the means of making it practical.

Marconi was born near Bologna, Italy, the son of an Italian country gentleman and an Irish mother. Tall, fair-skinned, blue-eyed, he was British in appearance, but in manner, Italian. He was educated in both Italian and English schools, gaining his scientific training at Leghorn and Bologna.

Even as a small boy he was keenly interested in electricity. His father wanted him to be a musician, but Marconi's interest in tones had chiefly to do with their scientific basis. When he was supposed to have been practising he was off somewhere experimenting with some electrical device.

At Bologna he watched eagerly the experiments of Prof. Righi with electromagnetic waves and went on to make some investigations of his own. In 1895 he set

to work in earnest. He substituted a vertical wire for the Hertzian form of resonator, improved the Branly coherer which he used as a detector, and invented an electric tapping device. With this apparatus he could send messages more than a mile. The next year he went to England and took out a patent—the first ever granted for a practical system of wireless telegraphy. The following year a company was formed, later known as Marconi's Wireless Telegraph Company, Ltd., to exploit wireless commercially.

By constant and patient work, he continued to invent and improve the basic devices, sending messages farther and farther. In 1910 he was able to receive signals at Buenos Aires, Argentina, from Clifden, Ireland, and in 1918 sent a message from England to Australia. Other scientists added their improvements to Marconi's and by 1921 "wireless" had become "radio," with broadcasting successfully established.

One of the first practical applications of wireless came in 1898, when Marconi followed the Kingstown Regatta races in a tug and flashed the results to a Dublin paper.

That same year a set was installed in the Prince of Wales' yacht to keep Queen Victoria informed of the progress of the Prince's illness. It was in 1898, too, that the importance of wireless in saving lives at sea was first demonstrated. The East Goodwin lightship was rammed in a fog and aid was summoned by the Marconi instrument. Then in 1909 the passengers of the sinking steamship *Republic* were rescued by ships signaled by wireless. Most governments have since passed laws requiring the installation of wireless apparatus on all passenger vessels.

As early as 1904 Marconi had established a ship news service, which has so grown that today ships thousands of miles out at sea receive bulletins of what is happening on shore almost as soon as it occurs, and passengers may receive and send personal messages or may even speak directly to persons on shore by radio-telephone.

In 1916 Marconi began extensive experiments to

confine radio impulses to a directed path, instead of letting them spread in all directions, as in ordinary broadcasting. By using a parabolic reflector behind the antenna, Marconi and his engineers were able to

focus short radio waves as a beam and to send them in one direction only. "Beam transmission," perfected in 1922, is now employed by most world-wide radio communication systems. Marconi sponsored and developed many special applications of his beam system. Among his inventions to help save lives at sea is a beam lighthouse that can direct signals to give ships their shore bearing in a fog. In 1934 he successfully demonstrated transmitter equipment that makes blind navigation of ships possible. Another invention, the auto-alarm, picks up distress signals when radio operators are off duty, and sounds an alarm (see Automatic Devices).

He applied radio waves less than one meter long to a wireless telephone for communicating over moderate distances. In 1932 this system was adopted for telephonic communication between Vatican City and the Palace of the Pope near Rome.

Marconi was awarded the Nobel prize for physics in 1909, and named to the Italian Senate the same year. A motor accident cost him the use of his right eye in 1912, but he did not let this handicap interfere with his work or his sports of yachting and motoring. He served in Italy's army and navy during the World War, and in 1919 he was a delegate to the Paris Peace Conference. In 1929, he was created a *marchese* (marquis). Under the Fascist régime he had charge of all scientific research until his death July 20, 1937.

**MARCUS AURELIUS ANTONINUS, ROMAN EMPEROR** (121–180 A.D.). In the second century of our era, the peace and happiness of the civilized world depended largely upon whoever happened to be the Roman emperor. He ruled Rome, and Rome ruled the world. But the ruler of Rome had a task of appalling difficulty. Generations of ease and luxury had made the patricians flabby and selfish. The middle class was rapidly being reduced to slavery and despair.

FATHER OF THE "S.O.S."



A great ship is sinking far out at sea. Passengers and crew—hundreds of human beings—are facing sure death in the raging waves. A man dashes to a small metal key, presses it quickly, and out into space, as fast as light, flashes the "S. O. S."—the signal of distress. Giant liners, greyhounds of the ocean, catch the signal and halt their headlong course. Around they turn and forge full steam to the rescue. The victims of the sea are saved, each one owing his life to the man who made wireless telegraphy possible—Guglielmo Marconi.

Germanic barbarians were pressing at the borders, and few Romans seemed willing to fight in defense of their homeland. These were the conditions which Marcus Aurelius faced when he became emperor in 161 A.D.

Marcus had been marked for this task almost from birth. It was usual at that time for Roman emperors who lacked sons to adopt kinsmen as their successors and train them for imperial duties. Marcus was adopted and educated by his uncle, who later became the Emperor Antoninus Pius; and when Antoninus died, Marcus succeeded him. Marcus Aurelius had been trained in the Greek Stoic philosophy, and he followed it throughout life. Although the wealth of the Mediterranean world was at his disposal, he chose to dress plainly, live frugally, and work from early morning to midnight. "Blot out vain pomp; quench appetite; keep reason under its own control," he counseled.

He placed the good of society before his own individual comfort. "What is not good for the swarm is not good for the bee," he wrote. He put good government into effect, limited the gladiatorial games, and passed laws benefiting slaves, heirs, women, and children. This pagan emperor, by the nobility of his principles, attained something like the loftiness of Christianity; but he persecuted the Christians themselves, for fear they would destroy the state. Though he loved peace, he was a good warrior, and throughout his life succeeded in defending the border provinces against invasion.

In his few spare moments, whether between battles or in the noisy amphitheater, he jotted down in Greek the rules that guided his own conduct. The resulting volume of 'Meditations' is one of the world's great books of wisdom.

Worn out by war and the burdens of state, he died in March of the year 180 A.D. He was the last of the "five good emperors," whose combined reigns, beginning with Nerva in 96 A.D., mark the golden age of the Roman Empire. Marcus was succeeded by his son, the infamous Commodus, in whose reign the empire began a steady and rapid decline (*see* Roman History).

**MARIA THERESA** (*tě-rā'sā*) OF AUSTRIA (1717-1780). What a host of difficulties surrounded Maria Theresa when in 1740, at the age of 23, she was proclaimed Archduchess of Austria and Queen of Bohemia and Hungary. The young and beautiful but inexperienced queen was surrounded by a circle of enemies. The unscrupulous Frederick the Great of Prussia took advantage of her youth and sex to seize the rich province of Silesia. The "Pragmatic Sanction" by which her father Charles VI had sought to change the Hapsburg rule of succession so as to permit of the rule of a woman, and which had been solemnly guaranteed by France, Great Britain, Russia, and other states, as well as Prussia, was now openly flouted. Bavaria and Saxony laid claims to Austrian lands with France's support; and Spain sought to seize her provinces in Italy. The result was the war of the Austrian Succession (1740-48) in which Great Britain alone fulfilled its treaty obligations.

Maria Theresa was not one to sit idly by while her lands were torn from her. Her husband, Duke Francis of Lorraine, was of little assistance; but her youth, beauty, and dangers aroused the loyalty of her people, and she heightened this by her eloquent and effective appeals. The Hungarian nobles came gallantly to the rescue of their young queen. Her most dangerous enemy, Frederick of Prussia, made peace in 1742, and though he reentered the war in 1744, his interest centered exclusively in Silesia. When peace was finally made in 1748 at Aix-la-Chapelle Maria Theresa was forced to confirm the cession of Silesia to Prussia, and to give up some of her Italian possessions to Spain, but retained the rest of her lands. Meanwhile her husband, as Francis I, had been elected Emperor of the Holy Roman Empire, with the aid that Prussia had promised.

#### Her Alliance with France

The loss of her possessions hurt Maria Theresa, and she set herself industriously to win France from its 200 years' enmity to Austria, in order that she might recover them. An alliance with France was brought about in 1756 by her clever minister Kaunitz. This she sealed later (1770) by the marriage of one of her 11 daughters, Marie Antoinette, to the dauphin of France, who later became the unhappy Louis XVI (*see* Marie Antoinette). Unfortunately Great Britain also at this time accomplished a "diplomatic revolution," by which she abandoned her old Austrian alliance and formed a new one with Prussia. When, therefore, the "third Silesian war" broke out in 1756—which broadened into a war between England and France for empire in America, in India, and on the wide seas—Maria Theresa found herself, in spite of an alliance with Russia and the desperate straits to which Frederick was reduced, still unable to force Prussia to loosen its clutch upon Silesia (*see* Seven Years' War).

In another direction Maria Theresa more than made good the loss to her hereditary estates—through her participation in the international crime of the first partition of Poland (1772). But she had the grace to weep over the iniquity which she committed, and in this differed from her fellow conspirators, the rulers of Prussia and Russia. The Peace of Teschen (1779), which averted a war with Prussia, was the last great act of her reign.

Maria Theresa did much to improve the lands she ruled over. She encouraged agriculture and industry, and abolished some of the worst feudal rights which burdened the serfs. She also abolished the use of torture. But she was a "benevolent despot," of the 18th century type, as was also her son and successor, Emperor Joseph II (1780-90) with whom she shared the rule after the death of her husband in 1765, and was careful to do nothing which would lessen her own absolute authority or which savored of democracy or self-government. During the 40 years of her reign she showed herself to be a noble woman, and one of the ablest rulers of her time.

**MARIE ANTOINETTE** (*má-rē' ān-twá-nē'*) (1755-1793). Near midday of Oct. 16, 1793, a cart crept snail-like through the Paris streets amid the howls and jeers of the populace. In it sat a woman in a ragged white dress with hands bound behind her, yet with traces of majesty in her stricken bearing and of beauty in her wasted face. At the Place de la Revolution the victim descended to mount the steps of the scaffold and lay her prematurely whitened head beneath the knife of the guillotine. That night the grave-digger entered a charge for the bier and grave of the "Widow Capet." Such was the end of a great empress' daughter, once the gayest, most beautiful, and most brilliant princess in Europe.

Marie Antoinette, fourth daughter of Maria Theresa of Austria, was married at 15 to Louis XVI of France, then dauphin or heir to the throne. A frolicsome, reckless, extravagant child, she shocked the soberer members of the French court by her disregard of etiquette. When she became queen (1774), her open favoring of Austrian interests and her enmity to the statesmen Turgot and Necker, and to their measures of reform and economy for relieving the bankruptcy of the country, made her distrusted and disliked. When the French Revolution broke out in 1789, the people came to think that their miseries were in part caused by the extravagances of "the Austrian," "Madame Deficit," or "Madame Veto," as she was variously called.

The frivolous girl meanwhile had become an obstinate woman who forced the king into a reactionary policy, to his undoing. A believer to the core in absolutism, she disliked even liberal monarchists like Lafayette and Mirabeau, and utterly failed to understand the troublous times into which she was flung. In October 1789, hungry Paris fishwives led a march on the royal palace at Versailles to bring the royal family to Paris, that they might more closely be watched. Marie Antoinette's cool courage in showing herself on the balcony for a moment overawed the mob, but did not change their purpose to bring back "the baker and the baker's wife," as in rough jest they called the king and queen. The monarchy's last hope of wise counsel died with Mirabeau in 1791. Less than three months later Louis XVI was persuaded to repudiate the reforms he had promised to accept and attempted to escape with his family from France with a view to war. They were captured inside the frontier and brought back to a darkening fate.

In August 1792, charges of treachery in the war with Austria led a revolutionary mob to storm the Tuileries palace, seize the royal family, and thrust them, prisoners, into the Temple. From there the king was led in December to trial and in January to execution. The queen was taken in August 1793, to the prison of the Conciergerie, where common criminals were confined. Her young son, the dauphin, had been torn from her in July. Amid insults and brutality she bore herself with dignity and patience,

but was convicted of treason on the ground that she had participated in plots and conspiracies against France. Her execution followed immediately. Of her guilt there can be no question, but she has never ceased to command the sympathy of posterity, as one of the most pathetic figures in history.

**MARIGOLD.** In the Middle Ages various golden-yellow blossoms that grew in profusion throughout southern Europe were dedicated to the Virgin Mary and called "Mary's gold" or marigolds. The flowers that we know best by that name are the so-called French and African marigolds, which were the delight of our grandmothers and bloom in our gardens from

#### MARIGOLDS OF GARDEN AND MEADOW



The Marigolds at the left are at home in the garden, where they bloom all summer. Like the dandelion, each flower is a composite of hundreds of individual florets.

Marsh Marigolds are succulent plants of the meadow and bog, with green heart-shaped leaves that make a striking setting for the golden blossoms. This plant is a buttercup and not a true marigold.



midsummer until frost. With their glowing yellow or orange blossoms, sometimes marked with reddish brown, their feathery leaves, and their characteristic aromatic odor, these sturdy plants have a quaint individuality and charm.

A different flower of the same family is the pot marigold or calendula. Its leaves were formerly used as flavoring for soups. It was named "calendula" because it was seen to bloom in the *calends* (first day) of almost every month. It blooms in the greenhouse as well as in the garden and is a favorite florists' flower.

Scientific name of African marigold, *Tagetes erecta*; of French marigold, *Tagetes patula*. These species have pinnately divided leaves and curled rays. Scientific name of pot marigold *Calendula officinalis*. In this plant the ray-florets are flatter; the leaves are oblong, pointed at either end, and grow alternately on the stalk. (See also Marsh Marigold.)



**MARINE CORPS, UNITED STATES.** The Marines are "soldiers of the sea." Their main duty is to support the Fleet of the United States Navy, and they are under the direction of the secretary of the navy. In emergencies, however, they may serve with the Army.

The Marine Corps assists the Navy in four ways. First, the Fleet Marine Force serves as an accompanying land force for the Fleet, to seize and hold advanced air or naval bases. It is a complete, small army in itself, made up of aviation, parachute troops, infantry, tanks, artillery (including antiaircraft and antitank weapons), armored scout cars and motorcycles for reconnaissance, and signal engineering, and chemical troops. Second, Marine detachments serve as part of the ship's crew on cruisers, aircraft carriers, and battleships. Third, under ordinary conditions, the Marines provide garrisons to protect naval yards and shore establishments. In time of emergency, however, these duties are taken over by the Naval Civilian Police, so that the Marines may be assigned to active military service. Fourth, Marines are stationed in foreign countries to protect American lives and property in times of disorder.

The Marine Corps is the oldest of the United States fighting services. It was inaugurated by the First Continental Congress Nov. 10, 1775. Its motto is *Semper Fidelis* (always faithful). The Marines have distinguished themselves in every war in which the country has been engaged; their activities have carried them to the most distant parts of the world. In the two World Wars they especially distinguished themselves at Belleau Wood, in 1918, and at Wake Island, in 1941 (see Belleau Wood; Wake Island).

The enlisted strength of the Marines has been set by law at 20 per cent of the enlisted strength of the Navy. Officers have ranks similar to those in the Army but take their seniority with Navy men. The Marine Corps Reserve is made up of the Fleet Marine Corps Reserve, the Organized Marine Corps Reserve, and the Volunteer Marine Corps Reserve. (See also Uniforms. For the famous Marine Band, see *Marine Band* in the *FACT-INDEX* at the end of this volume.)

The British and United States services are the only ones in which the Marines are a separate, specialized force organized to act with the Navy. Other countries sometimes designate as marines their coast defense soldiers and those who garrison forts and colonies.

**MARION, FRANCIS** (1732-1795). During the Revolutionary War the British were balked in their attempt to subdue South Carolina chiefly because of the guerrilla warfare waged against them by a group of bold and ingenious fighters.

Our band is few, but true and tried,  
Our leader frank and bold;  
The British soldier trembles  
When Marion's name is told.

Thus are the exploits of Francis Marion, one of these gallant generals, described by William Cullen Bryant in 'The Song of Marion's Men.' The other "partisan" leaders in South Carolina were Thomas Sumter and Andrew Pickens, whose military skill helped save the

state until Congress could send further help. Their followers were often patriotic farmers and backwoods-men as well as regular army men.

Francis Marion was born in South Carolina in 1732, probably in St. John's Parish, Berkeley County. His Huguenot grandfather, Benjamin Marion, had been exiled from France in 1690 because of his religion and had come to South Carolina. When Francis was about 27 years of age, he served in expeditions against the Cherokee Indians. In 1775 he was a member of the South Carolina provincial congress, and when this congress voted money for raising troops he was made a captain. An injury kept him from being at Charleston, S.C., when that city was captured in 1780. Taking refuge in forest and swamp with a force of men known as "Marion's brigade," which varied in numbers from a mere handful to several hundred, he became the terror of the English in that section. When the foe was least expecting it, the brigade would dash out, capture a detachment of British troops, or rescue a band of American prisoners, and dash back again to their hiding places. As Colonel Tarleton, the British commander, said, it was impossible to catch the old "swamp-fox"; under this title Marion has become legendary for his military cunning. In the closing months of the campaign, as brigadier general of the militia, he cooperated with Gen. Nathanael Greene to win final victory.

After the close of the war, Marion served several terms in the state senate, was made commander of Fort Johnson, and was a member of the state constitutional convention in 1790.

**MARLBOROUGH** (*mār'l'bò-rū*), **FIRST DUKE OF** (1650-1722). When John Churchill at the age of 15 became page of honor to the Duke of York (later King James II), he was known merely as a poor and ambitious lad of good family, handsome features, and polished manners. When he died, nearly 60 years later, he had been made Duke of Marlborough and was renowned throughout Europe as the greatest general of his age and one of its greatest statesmen.

Many things helped him in this phenomenal rise. The friendship of the Duke of York for his sister Arabella won for him his appointment as page and later, at the age of 17, a commission in the army. He learned the art of war while serving with England's French allies under the great Marshal Turenne in a war with the Dutch. His rise at court was further aided by his marriage, at the age of 28, with Sarah Jennings, the clever, beautiful, imperious attendant and bosom friend of Princess Anne.

Churchill himself was a man of unfailing politeness, tact, and good temper, and of great military and political talents. When the follies and tyranny of his old patron turned all England against James II, Churchill took a leading part in the revolution which made William of Orange king as William III. He was rewarded by being made Earl of Marlborough. He was of great service to William III in conquering Ireland, which clung to James II, and as commander

against the French in the Netherlands. But he was never wholly trusted by the new king. There was good ground for this, for Marlborough tried to "carry water on both shoulders," as the saying is, by secretly entering into communication with the exiled king, while openly supporting William III.

When Queen Anne came to the throne, in 1702, she showered the richest positions upon Marlborough and his wife. These included the title of Duke and the position of commander-in-chief of the English forces and the chief influence in the government. His abilities, however, were equal to his opportunities. A Frenchman once said that "he never besieged a fortress that he did not take, never fought a battle that he did not win, and never carried on a negotiation that he did not bring to a successful close."

During the War of the Spanish Succession—in which England's chief interest was to prevent France from obtaining Spain, with its vast colonies and dependencies—Marlborough showed his unrivaled generalship in some of the greatest campaigns in English history. On Aug. 13, 1704, as commander of the Dutch and English forces, acting in harmony with Prince Eugene of Savoy, the Austrian commander, he won a great victory over the French at Blenheim, in southern Germany. This battle stamped Marlborough as the first general in Europe. It broke the spell surrounding the great power of France under Louis XIV, and insured the continued exclusion of the "Jacobite" line, descended from James II, from the English throne. The victory also helped to lay the basis for English rule both in North America and in India. Hence the battle of Blenheim has rightly been counted by the historian Creasy one of the decisive battles of the world.

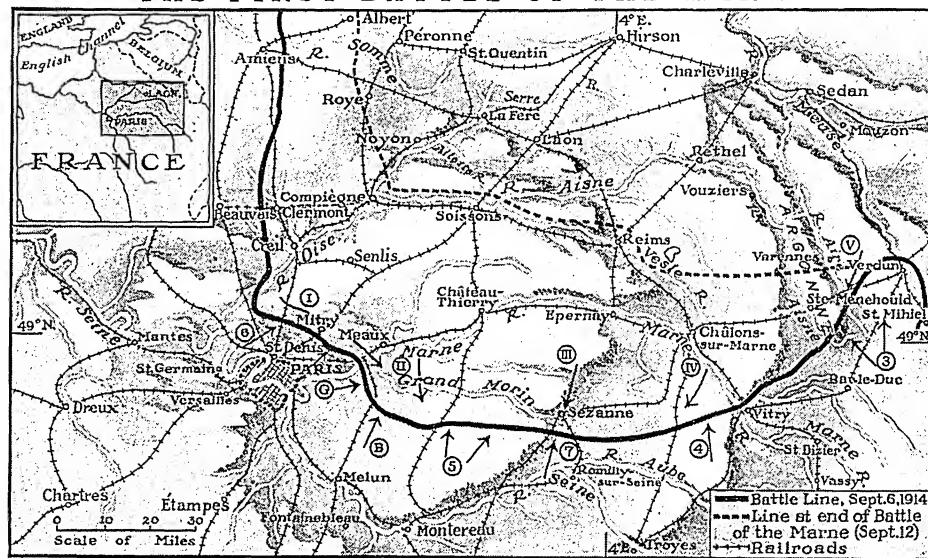
In 1706 the battle of Ramillies, in 1708 that of Oudenarde, and in 1709 Malplaquet, continued Marlborough's career of victory. And as a result of these victories England was able to negotiate the profitable Peace of Utrecht in 1713, which gave Europe peace for 30 years.

Marlborough, however, had fallen from power before this treaty was negotiated. The queen had at last tired of the tyranny of Duchess Sarah, and threw

off her yoke. Then Marlborough's enemies succeeded in having him dismissed from power (1711). He was even charged with embezzling public money, but was cleared. When George I came to the throne in 1714, after Anne's death, Marlborough was restored to his military posts. He died in 1722, and his remains now rest in the chapel at Blenheim, the magnificent palace erected for the Duke, near Oxford, at the Queen's expense, before his fall from favor.

**MARNE RIVER, FRANCE.** Two crucial and most spectacular battles of the World War of 1914-18 are associated with the Marne River, which winds for 326 miles across the fairest portion of northeastern France. Its general course is steadily westward until just outside of Paris it joins the Seine, of which it is the largest tributary. Connected as it is with the Meuse, the Rhine, and other large rivers by a network

### THE FIRST BATTLE OF THE MARNE



North of the battle line the approximate positions of the German armies at the beginning of the battle are shown by Roman numerals in circles. Thus the numeral I indicates the First German Army, commanded by von Kluck, and V, the Fifth Army, commanded by the German Crown Prince. South of the line the positions of the Allied armies are in the main shown by Arabic numerals. The numeral 6 represents the new Sixth French Army under General Manoury, which was brought up on von Kluck's exposed flank, and the position of General Gallieni who attacked with the Paris garrison (C), and of General French and the British Army (B), are shown by letters.

of canals, and flanked by important railway lines, the Marne and its broad valley form one of the chief approaches to the French capital—a fact that explains the part it played in the World War.

The First Battle of the Marne took place from Sept. 6 to Sept. 10, 1914. The German armies, following their swift drive through Belgium in August, had swept over France and to the very outskirts of Paris. General von Kluck, who was in command of the German right wing, was less than 20 miles from the capital. "Victory is ours!" was the message sent back to Berlin.

Then, suddenly, the unforeseen happened. General Joffre, the French commander-in-chief, who had been doggedly retreating until the favorable opportunity to strike presented itself, sent out this message:

"The hour has come to advance at all costs, and to die where you stand rather than give way." General Gallieni, the white-haired defender of Paris, loaded his troops into trucks, omnibuses, and taxicabs, and rushed them to the front, to attack von Kluck's right flank. At the same time, Generals Manoury, D'Esperey, and Foch, and the British under Sir John French, struck the over-confident Germans on the left flank and in the center. In a great four-day battle the Germans were driven back to the river Aisne, and the first great peril to France was over.

The Second Battle of the Marne took place in July 1918, nearly four years later. The Germans, in a supreme effort to break the deadlock of French warfare before the full force of the United States was cast into the struggle, had launched a great offensive beginning March 21. By July 1, they had crossed the Marne River for the second time in the war, and although they had been halted with the aid of United States troops in the famous battle of Château-Thierry early in June (*see* Château-Thierry), they were within striking distance of Paris.

On July 18, Foch, who had become commander-in-chief of all the Allied forces, threw American and French divisions under Generals Mangin and Degoutte against the Germans' north flank, which crumbled at the first stroke. This was followed immediately by another blow from the south, and on July 25, both banks of the Marne were cleared of the enemy. Then began the general retreat, which with a few interruptions continued until the armistice. American divisions in the Second Battle of the Marne were the 1st, 2d, 3d, 4th, 26th, 28th, 32d, and 42d.

The Marne again witnessed severe fighting when, on June 12, 1940, the Germans, sweeping down from the north, overcame the French at the Marne and crossed the river. Two days later, Paris fell.

**MARQUETTE** (*mär-kët'*), JACQUES (1637-1675). On the white beach of St. Ignace, where the Straits of Mackinac connect the waters of Lake Huron and Lake Michigan, a crowd of gaily-clad Indians and picturesque French traders were gathered, early one morning. In the little bark chapel near at hand the blessing of the Virgin had been asked on the voyage of discovery upon which Marquette, the father of the mission, and his venturesome companion Louis Joliet were embarking. Clad in the long black robes of the Jesuit order, Father Marquette had blessed all his people, red and white. Stepping at last into their birch-bark canoes, the explorers bent to their paddles, only pausing as they rounded the point to wave a last farewell.

It was May 17, 1673, when these two with their five voyageurs in two canoes started on their epoch-making expedition. Paddling along the shore they entered Lake Michigan and safely traversed the wind-tossed waters of Green Bay to Fox River. Ascending that river to near its source, they then "portaged" or carried their canoes on their shoulders across country "2,700 paces" to the Wisconsin River.

For seven days the paddles drove the light canoes down the slow-moving Wisconsin. Upon the morning of the eighth day (June 17) the waters widened and the voyageurs suddenly paddled into the muddy current of the mighty stream of which they had heard—the *Missi-sipi*, or Great River. They were the first white men to behold the course of the "Father of Waters" since De Soto's unhappy discovery, 130 years before.

The journey so far had been pleasant. The Indians visited had been friendly and had listened eagerly to the words of the pale-faced "Black-Robe." But the remainder of the voyage, as they traveled hundreds of miles down the mighty stream, was not so easy. Marquette wrote of the "monstrous fish" which they came upon from time to time. They looked with horror upon hideous monsters painted high on the cliffs above the river. They were forced to use caution in approaching the unknown Indian tribes of the region. But usually they were well received by the red men, and were feasted on parched corn and dogs' flesh. To all Marquette preached Christianity, and he gave his promise to the Illinois Indians that he would return to them "within four moons."

#### As Far as the Arkansas

At length on July 17, having gone almost as far south as the mouth of the Arkansas River, the explorers turned back, for they feared capture by the Spaniards if they continued. They were now convinced that the river emptied into the Gulf of Mexico, and not the Western Sea (Pacific) as they had hoped.

With difficulty they paddled back against the mighty current of the Mississippi. When they reached the mouth of the Illinois River, they turned into it, paddled to its source, and portaged to the foot of Lake Michigan. In the last days of September they regained the little Jesuit mission on Green Bay which they had left five months before.

In that time they had traveled more than 2,500 miles, a distance comparable to that covered by De Soto in the southeast or by Coronado in the southwest. And just as the names of these two are inseparably linked with the regions they traversed, so the names of Father Marquette and his companion Joliet are linked with the upper course of the Mississippi.

The expedition, which was of such great importance to the French by increasing their knowledge of North America, proved fatal to the frail Jesuit father. He did return the next winter to the Illinois Indians as he had promised, but on his way back to the mission at St. Ignace, he died in a little hut in Michigan, near the stream which now bears his name.

Marquette was a member of one of the proudest families of Laon, France. Since 1666 his life had been spent among the Indians of the Great Lakes region—at Sault Ste. Marie, at St. Esprit (near the western extremity of Lake Superior), and at St. Ignace. The winter after his death some of his red-skin friends carried his body from its lonely grave to the mission which he had established at St. Ignace.

## MARRIAGE—The Age-Old PROTECTION of the FAMILY

*Customs and Laws, Past and Present, Which Have Been Developed to Safeguard the Interests of Husbands, Wives, and Children*

**MARRIAGE.** Of all institutions that rule the lives of men marriage is one of the oldest and most sacred. Edward Westermarck, an anthropologist whose researches into the history of marriage made him one of the foremost authorities in this field, said that "marriage is rooted in the family" (see *Family and Tribal Life*). The essential feature of marriage, distinguishing it from a temporary union, is that it is a contract between the husband and wife involving mutual consent, and that it is concluded publicly and with the approval of society.

### Marriage Regulated by Society

The regulation of marriage by the state or by society, either by custom or by law, is as old as the institution itself. Even among the most primitive peoples there have been definite rules declaring who may or may not marry. Among almost all peoples marriage between those considered to be related is forbidden, but with certain other peoples it is forbidden to marry outside one's own tribe. The latter custom is called *endogamy* (from the Greek *endon*, within, and *gamos*, marriage); it is practised in India, where persons may marry only members of the same caste. Religion often imposes another type of endogamy. Mohammedans, Jews, Christians, and Hindus are expected to marry only within their own religions.

Opposed to *endogamy* is *exogamy*. Here a large number of people are regarded as related and marriage among them is forbidden. Among the North American Indians many tribes are divided into clans, each clan having a totem or symbol, which is usually an animal, from whom it traces ancestry or derives special privileges. No couple having the same totem may marry. They must look outside the clan for their mates.

Laws governing marriage vary in different countries and even among states of the United States, but in general throughout the civilized world a marriage which is legal in the place where it is contracted is binding everywhere. The legal marriageable age varies; among some peoples children are pledged in marriage in infancy. In the United States the legal age for marriage is fixed by state law; usually it is 16 for women and 18 for men. Marriages are made a matter of public record. Licenses must be obtained, and the ceremony must be performed in the presence of witnesses by designated civil officials or clergymen.

### The Regulation of Divorce

From the earliest times it has been permissible for a husband to leave his wife, or, in those primitive societies in which the matriarchal system prevailed, for the wife or her kinsfolk to repudiate the husband.



Among most peoples, elaborate costumes are worn by the bride and groom when they are married. Here are typical peasant costumes worn for many centuries on such occasions in the Schaumburg-Lippe region in Germany.

The justifications for divorce among primitive people were, with the addition of witchcraft, the same as those which now prevail by law. In ancient Athens, however, a husband could dismiss his wife at his pleasure, and the wife could leave her husband with the permission of the archon, a chief judicial official. Among the Romans, divorce procedure depended on the terms of the marriage contract.

During the Middle Ages, and in later centuries until the French Revolution, the attitude of the Christian church—holding that marriages could not be dissolved—prevailed in law as well as custom. In England and the English colonies, including North America, divorce was originally granted by special legislation in each case, but is now granted by the courts. Every state of the Union except South Carolina now permits divorce.

### Bride Price and Dowry

Except in the comparatively rare cases where marriages were contracted by capture and no ransom paid, it is hard to find any widespread system where some financial arrangement did not enter. As a matter of fact, the very word *wedding* had its origin in the custom of wife purchase, the "wed" being the forfeit or pledge given by the groom to the girl's parents as security for his purchase of the bride.

Sometimes there was an exchange between families of bride for bride. Sometimes the groom worked for



the bride's parents for a certain length of time before the marriage, or he simply paid so much in property for the girl. The kind of property varied. Among North American Indians it was often horses; in Africa, cattle or goats; in eastern Europe, oxen. Payment of some kind has been the rule among most peoples. It was customary in ancient Greece, in Rome, Babylonia, Arabia, Egypt, among Teutonic, Slavonic, and Celtic peoples, and in modified form persists to the present day in various countries. Sometimes the parents of the girl used the bride price to provide the bride with household effects and money as a dowry.

The custom of providing a bride with a dowry persists in Latin countries to the present day, especially in France (where it is called *dot*), although according to the *Code Napoléon* French parents are not bound to provide one. At certain times, such as the period following a war, when there are more women than men, this custom provides a convenient way of purchasing a husband. In India, among high castes, large sums are given to provide a girl with a well-educated and high caste husband.

Since one of the most important functions of the marriage ceremony is to give publicity to the union, feasting and some sort of religious celebration are almost universally a part of weddings, although among some American Indian, Australian, and South Sea tribes there are practically no ceremonies. The religious rites were designed not only to bring blessings upon the couple but to protect them from evil. In Christian countries, marriage is usually solemnized with religious ceremonies, and Roman Catholic doctrine teaches that matrimony is a sacrament. The Council of Trent in 1563 decreed that a marriage must be celebrated by a priest in the presence of two or more witnesses. Jews and Mohammedans also make a religious ceremony of marriage, although there is no formal requirement of this in their religious systems. The Jewish custom of having rabbis at weddings dates from about the 14th century.

#### Wedding Anniversaries and Traditions

Anniversaries of the wedding day are named from a custom of giving a distinctive anniversary gift. The first is called the paper wedding; the second, straw; third, candy; fourth, leather; fifth, wooden; seventh, floral; tenth, tin; twelfth, linen; fifteenth, crystal; twentieth, china; twenty-fifth, silver; thirtieth, pearl;

thirty-fifth, coral; fortieth, emerald; forty-fifth, ruby; fiftieth, golden; seventy-fifth (or sometimes the sixtieth), diamond.

A number of the traditional wedding ceremonies have come down to us from the remote past. The best man and the other groomsmen have been explained as survivals of the practise of wife capture, when the bridegroom's friends used to help him carry off his bride by force. The honeymoon is considered by some to be a survival of the days when a man, after capturing his bride, remained in hiding with her until the wrath of her family died down. The wedding ring is also considered as a symbol of captivity. In some

parts of the world, as in ancient Greece and Rome, it was considered in good taste for the groom to make a show of carrying off the bride by force. In remote parts of Ireland a wedding is considered very dull indeed unless the bride attempts to escape and is overtaken and captured by the groom. And to this day it is proper for the bride to weep bitterly, no matter how happy she may really be.

The wedding cake is another object of

romantic superstition. A ring is sometimes baked into the cake and the person who finds it is supposed to be the next one to marry. Also, small pieces of the cake are regularly distributed to be taken home and placed under the pillow, it being presumed that one's future husband will thus reveal himself in a dream.

#### The History of Wedding Cakes

The cake itself has had quite a long and interesting history. At the Roman *confarreatio*, a form of marriage, the couple ate a cake made of salt, water, and flour. The bride carried three wheat ears as a symbol of plenty or fruitfulness. In the Middle Ages this custom took the form of throwing wheat grains after the bride, and later, of baking the grains into biscuits which were broken over the bride's head. Still later it became the custom in England to bring small richly spiced buns to a wedding. These were piled into a tall mound over which the bride and groom were to kiss. If they succeeded, prosperity was assured them. But the mounds were cumbersome, and it is said, a French cook conceived the idea of icing them into a solid whole. This, then, was the origin of the wedding cake. Traditionally the bride herself cuts the first slice as a security that no outside force shall cut into her happiness.

#### WHEN BRIDE AND GROOM MEET IN JAPAN



Here the prospective couple meet formally for the first time, under the auspices of the matchmaker (right), and the bride's father (left). The groom in the center, is drinking the ceremonial cup of tea, a feature of the meeting.

**MARS.** Next in importance to Jupiter in the Roman religion was Mars, the god of war. He was regarded as the father of the Romans, through his son Romulus, the legendary founder of the city, and was

#### OUR INTERESTING PLANET NEIGHBOR



This is part of a series of telescopic photographs of Mars, taken to study the changes in appearance due to rotation. These changes are too slight to be conspicuous here, but you can see the white spot of the Martian "polar region" very distinctly. The dark belt around the middle is supposed by some to be a vast region of dense vegetation about the planet's equator.

worshiped with great honor. He was in early times a god of nature and fertility, as well as of the vigor of war. Thus March (Latin *Martius*), the season when agriculture as well as warfare was resumed after the inactivity of winter, was dedicated to him and known by his name.

The Greek god Ares is identified with Mars. But the Greeks thought of Ares only as a sender of war and pestilence, a quarrelsome god, delighting in the slaughter of men and the destruction of cities. He was not widely worshiped in Greece, although the Areopagus, the sacred hill of Athens, was named from Ares.

In astronomy the name Mars is given to the fourth planet in order from the sun, lying just beyond the earth—supposedly because of its red and angry countenance. (See Planets.)

**MARSEILLES** (*mär-sälz'*), FRANCE. The tang, the mystery, and the romance of the sea belong to Marseilles, the chief seaport and the second largest city of France. For more than 2,500 years, this city on the Mediterranean coast has been a port for vessels bringing people and cargoes from far lands.

Marseilles, only 450 miles from North Africa, is the

port of France for sea trade with the French colonies there and with Asia. It is also the center of air travel from Europe to northern Africa. So vast has its commerce grown that the city has added several miles of docks and quays to its harbor. From inland France, products for export reach Marseilles by way of the Rhone River. This is connected with the harbor by a 50-mile canal, passing nearly  $4\frac{1}{2}$  miles through the famed Rove Tunnel (see Rhone River). Commerce by sea and canal gives Marseilles a wealth of raw materials for manufacture. It has refineries for sugar, olive oil, and petroleum; mills for rice and oilseed; smelters for iron and copper ores; and factories that produce chemicals, soap, automobiles, and machinery.

The city sprawls among rolling hills. Much of the old section has mysterious byways and dingy buildings; the newer part has wide streets and fine homes. But it is the bustling waterfront, with its brawny swaggering seamen, that gives Marseilles its gusty flavor. It was troops from this vigorous city who, in 1792, sung a new march so dashing that under the name of 'The Marseillaise' it became the national song. The famous waterfront suffered some damage from air raids in the second World War. Southwest of the city is the tiny island of Château d'If, scene of Dumas's story, 'The Count of Monte Cristo'.

Marseilles (in French, *Marseille*) was founded under the name Massalia by the Greeks about 600 B.C. It was Christianized in the 3d century, its first martyr being St. Victor, a Roman soldier put to death in the persecutions of Diocletian. In the Middle Ages, it was a port of departure for the Crusaders (see Crusades). In 1848, a 97-mile canal was completed, bringing from the Durance River a much needed supply of fresh water. The opening of the Suez Canal in 1869 brought Asiatic trade and thus made the city grow rapidly. Population, about 915,000.

## *The FATHER of AMERICAN CONSTITUTIONAL LAW*

*The Man Who Gave to the Supreme Court Its High Place in the American Government—The Far-Reaching Decision in the Case of Marbury vs. Madison*

**MARSHALL, JOHN** (1755-1835). When John Jay, the first chief-justice of the United States, resigned that office to become governor of New York, he gave as his reason that the Supreme Court could never acquire proper influence and dignity! Less than 40 years later John Marshall, the fourth chief-justice, after making that tribunal the world's greatest court, declared that he would rather hold that office than be president of the United States.

No other American did so much to reveal the great extent of the American judicial power, or to teach his countrymen the true meaning of the Constitution and the scope and possibilities of the powers granted to the general government. The decisions of the Supreme Court in the 34 years that Marshall was chief-justice—especially during the earlier period—were bitterly criticized by the party of Thomas

Jefferson, but today his reasonings and his exposition of the law are accepted almost without dissent. By universal consent Marshall is now regarded the greatest jurist that America ever produced, and one of the greatest in any land.

Marshall's great fame as chief-justice has overshadowed his other services to his countrymen. Like Washington, Jefferson, and Madison, he was a Virginian, and like Patrick Henry he loved best the free life of the sparsely settled frontier about his father's Fauquier county home. He was fond of sports of all sorts, in which he excelled in spite of his loose-jointed and somewhat ungainly figure. He had no adequate education. At the age of 20 he interrupted his study of the law to enlist in the Continental army, in which he rose to be captain. He fought under Washington at Germantown and Monmouth,

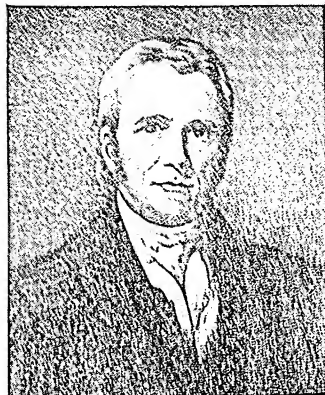
and was in the daring dash of "Mad" Anthony Wayne at Stony Point. When the Revolution was over he returned to his law studies and was soon admitted to practice. Presently he won a big land-title case for Lord Fairfax's tenants against their landlord, and this brought him the leadership of the Virginia bar.

Already Marshall had been elected to the Virginia legislature, where he served for eight sessions. In the Virginia convention of 1788, he and James Madison won the battle for ratification of the Federal Constitution against the efforts of Patrick Henry and Richard Henry Lee. President Washington offered him first the post of attorney-general, and then that of minister to France, but Marshall declined both; for, as he said, his position in Virginia seemed "more independent and not less honorable than any other." He did accept an appointment from President John Adams as one of the three commissioners to France in 1797-98, and approved of the answer to the corrupt agent of the Directory, which one of the commissioners summarized as "millions for defense but not one cent for tribute!" (see X Y Z Affair). A term in Congress followed, and then came a year's service as secretary of state in Adams' cabinet. Finally, on Jan. 31, 1801—only 32 days before that Federalist president went out of office—he appointed Marshall to the vacant chief-justiceship of the Supreme Court.

So persuasive was Marshall's personality, and so sound and penetrating his reasoning, that he soon won to his way of thinking the other members of the Supreme bench. In his first great case, that of *Marbury vs. Madison*, he declared it was the duty of the court to disregard any act of Congress—and hence of a state legislature—which it thought contrary to the Federal Constitution. Upon this decision rests the chief power of the Supreme Court today, that of declaring laws unconstitutional. Equally far reaching was the decision in the case of *McCulloch vs. Maryland* (1819) in which the Hamiltonian idea of "implied powers" in the government was fully sustained. "Let the end be legitimate," said the chief-justice, "let it be within the scope of the Constitution, and all means which are appropriate, which are plainly adapted to that end, which are not prohibited, but consist with the letter and spirit of the Constitution, are constitutional." From this doctrine comes much of the authority which the government has over commerce, the militia, the acquisition of new territory, and the vast powers exercised in time of war; for it means that the United States is a nation, with the powers appropriate to a nation, and not a mere weak confederation of practically independent states.

To Jefferson and those of the states'-rights school of thought, such decisions were profoundly disquieting. "The great object of my fear," wrote Jefferson in 1820, "is the Federal judiciary. That body, like gravity, ever acting, with noiseless foot and unalarming advance, gaining ground step by step, and holding what it gains, is engulfing insidiously the special governments (states) into the jaws of that which feeds them." But what Jefferson feared as a preparation for tyranny, we now regard as a development indispensable for national power and security.

Marshall's legal ability alone would not account for the strong influence he exercised. His clear thinking and his simple kindly personality impressed all with whom he came in contact, and joined to his other admirable qualities produced a character which left an imprint on his country such as few men have ever made.



JOHN MARSHALL  
America's Greatest Jurist

**MARSH MARIGOLD.** Early in April the bright yellow cups of the marsh marigold gild the wet borders of rivers and streams, or huddle together on little islands in low swamps and marshes. They are not true marigolds, these attractive saucer-shaped wild flowers, and much less are they true cowslips, though often called by the name of those pretty English blossoms. They look very much like large buttercups, and indeed it is to that family that they rightfully belong. They grow in great profusion from the Carolinas to Iowa, in the Rocky Mountains, and far northward. They are common in England, where they are often called kingcups. They are the "winking Mary-buds" of Shakespeare's poem in 'Cymbeline'. In the spring, when they are tender, the leaves may be boiled for "greens," and the flower buds preserved in vinegar and used like capers. (See Marigold.)

The marsh marigold belongs to the buttercup family *Ranunculaceae*, scientific name, *Caltha palustris*. Flowers 1 to 1½ inches across, with 5 to 9 glossy, oval, petal-like sepals, and numerous stamens and pistils. Stem stout, furrowed, hollow, and branched near the top. Leaves rounded, heart-shaped at the base, and growing either on long stems from the root or clasping the stalk where it branches.

**MARTEN.** The Siberian sable marten is the most aristocratic member of this branch of the weasel family. For it is the sole source of the famous and expensive fur called sable. A single fine skin of genuine Russian sable is worth \$2,000 or more, and a coat of this dark lustrous fur may sell for \$75,000. Sable fur is so fine and even that each single hair tapers gradually to a point; that is why sable brushes are the best for painting; they always form a point when wet. Even these brushes, though made up of hair taken from fragments of the least desirable skins, are very expensive.

Martens of various species are abundant in the northern portion of the Old and New Worlds. They

have long slender bodies and short legs, and live mostly in trees, leaping from one to another much like squirrels. Their outer fur is long and glossy, with an abundant soft under-fur.

In North America there are two species of marten, with a variety of local names. The American pine-marten or Canadian sable, similar to the pine-marten of Europe, is about the size of the large house cat. It has a soft deep fur of rich brown, lighter colored below with a tawny spot on the throat, which is largely used as a substitute for Russian sable. It is fond of forests far from the habitation of man, and shows special liking for pine trees. Its range is the northern woods, but even there it now is rare. It feeds upon birds and other animals. It multiplies rapidly, there being six to eight young to a litter.

The black marten, fisher, or pekan, as it is variously called, is the largest of the group, being from two to three feet long, with a bushy tail a foot or more in length. It has no immediate relatives in the Old World. In color it is grayish-brown, with dark markings, its tail tipped with black. It is bold, strong, and aggressive, a skillful hunter; it kills bear-cubs and the Canadian porcupine. It is successful in stealing bait from traps, and is a nuisance to trappers. It, too, belongs to the northern woods, occurs southward in the Alleghenies, and shows preference for regions of hemlock and spruce. The stone-marten is another variety, with hair inclined to grayish-brown and pure white on the breast. It is found in most parts of Europe south of the Baltic.

Scientific name of pine-marten, *Mustela martes*; black marten, *Mustela pennanti*; Siberian sable-marten, *Mustela zibellina*; American pine-marten, *Mustela americana*.

**MARTINIQUE** (mär-tī-nēk'). Tourists who visit Martinique, one of the small group of island colonies of France in the West Indies, find two spots of great historic interest. The first is the ruins of the quaint old house in which the unhappy Empress Josephine, Napoleon's wife, was born. The other is the scene of desolation that marks the site of the once beautiful city of Saint Pierre, formerly the largest and most flourishing town on the island. It was totally destroyed on May 8, 1902, by an eruption of Mont Pelée. Molten lava, a shower of stones and ashes, and poisonous gases killed about 40,000 people.

Mont Pelée (4,428 feet) is the highest point in a thickly wooded mountain ridge, which gives the hot, rainy island much of its picturesqueness. Of volcanic formation, Martinique is irregular in shape, with rugged, deeply indented coasts. Its area is 385 square miles. The French have a naval base at Fort-de-France, the capital.

Somewhat more than a third of the island is under cultivation. Sugar, rum, cocoa, coffee, tobacco, and cotton are the leading products. The farms are served by well built roads, and some of the sugar cane plantations have little railroads of their own. The animal life consists largely of small reptiles and insects, but opossums and the Martinique black-

bird are abundant. The deadly fer-de-lance serpent once was common, but the mongoose, imported from India, has all but exterminated it. (See also West Indies.)

Columbus probably discovered Martinique on June 15, 1502. France seized and colonized the island in 1635, and has held it since then except for brief periods of British occupation—in 1762, from 1793 to 1801, and from 1809 to 1814. Negro slavery, which began early, was abolished in 1860.

The island is controlled by a governor and a privy council, with an elected general council. The French Republic gave Martinique a senator and two deputies in the French parliament, but this representation was suspended when France established an authoritarian government in 1940. The United States made an agreement with the local authorities in 1941 for the island's neutrality in the World War. The population of 245,000 is almost entirely negro and half-caste.

**MARTYRS.** "The blood of the martyrs," wrote one of the early Christian Fathers, "is the seed of the church." For, by the heroic courage with which they endured persecution and died for their faith, they won thousands of converts and so Christianity triumphed over Greek and Roman paganism.

The word comes from the Greek and means a "witness." Stephen, who was stoned to death in the days of the Apostles (see Acts vii) was the first of the Christian martyrs. Altogether about 14,000 martyrs are included in the records of the Roman Catholic church. Among the most famous are St. Lawrence, who is said to have been roasted on a gridiron in the year 258, during the persecution of the Emperor Valerian; and St. Sebastian, a captain of the pretorian guard under Diocletian, who was condemned to be shot by a troop of archers for his faith. Sebastian's martyrdom has been a favorite subject with painters, who represent him as a beautiful youth bound to a tree and pierced by countless arrows. In 1563 an English clergyman named John Foxe published a 'Book of Martyrs' commemorating those who had died for Protestant beliefs.

**MARX, KARL** (1818-1883). A brilliant youth, the son of a prosperous Jewish lawyer in Trèves, Karl Marx as a German university student was expected to win success in his father's profession. But his mind wandered away from his study of law to brood upon social and economic problems, and he became the founder of modern Socialism and the greatest of all socialist writers.

"Why are the laborers the poorest of all classes of people?" he asked himself. "Wealth is the product of their labor; yet of this wealth they receive scarcely a sufficient share to maintain life. The balance goes to those who command their labor, the capitalists. The capitalist class, then, is enriching itself by withholding from labor part of its rightful share." Reasoning in some such manner as this, Marx finally came to the conclusion that there was an inevitable conflict between labor and capital. All through history, as he saw it, this class struggle had been going on. It was slave against freeman in ancient times, serf against lord in the Middle Ages; and now between capitalist and laborer the struggle must continue until the



workers should win from their oppressors the instruments of production and establish the socialist state.

These principles were first clearly formulated in the 'Communist Manifesto' drawn up by Marx and his friend Friedrich Engels as the program for the Communist League, which met in London in 1847. This famous document, with its rallying cry, "Workmen of all countries unite!" marks the beginning of the modern international socialist movement. It "is to modern Socialism what the Declaration of Independence is to America."

But before he became the founder and leader of Marxian Socialism, Karl Marx had passed through many hard experiences, and there were further trials in store for him. He had been editor of a paper in Germany which was suppressed because of its radical tendencies. He then went to Paris, but was expelled from France within two years, and sought another home in Brussels. In the meantime he had married his childhood sweetheart, Jenny von Westphalen, who though of gentler birth than himself and reared in luxury cheerfully shared the poverty which was often to bring them and their children to the verge of starvation. During the attempted Revolution of 1848 Marx returned to Germany, but was ordered to leave that land in 1849. He then settled in London, where he remained to the end of his life.

#### The "Bible of Socialism"

His death, hastened by overwork and by sorrow over the loss of his wife, came before he had finished his great work on political economy, entitled 'Capital'. This book, completed and edited by Engels, has been called "the Bible of Socialism." It is based on the so-called "materialistic" or "economic" view of history, which emphasizes the idea, as Engels puts it, "that first of all men must eat, drink, have shelter and clothing, and therefore must work, before they can struggle for supremacy and devote themselves to politics, religion, philosophy, etc."; and that therefore the social ideas and institutions of a time are determined mainly by economic conditions. Marx shows that the capitalistic era of production has played a necessary part in social development; but having reached its highest point, he claims, it must be followed by another order.

Marx emphasized the importance of "class struggles" and regarded as inevitable the revolution of the workers ("proletariat") against the capitalist class ("bourgeoisie"). He proposed methods for hastening this revolution. His teachings became the foundation of the Bolshevik revolutionary program in Russia and of the present Soviet state. (See *Bolshevists; Socialism.*)

**MARY, QUEENS OF ENGLAND.** In the long list of rulers of England the names of women appear only five times, and two of these five bear the name Mary.

MARY I, called Mary "the Catholic" or Mary Tudor, reigned from 1553 to 1558. She was the daughter of Catherine of Aragon and Henry VIII and was born in 1516. At first she was a favorite with her father, but when none of Catherine's other chil-

dren lived and this homely sickly daughter was left as his sole heir, he grew to dislike her, especially after he obtained a divorce from her mother that he might marry Anne Boleyn. During the rest of his life, and that of his son, Edward VI (1547-53), Mary was harshly treated, for she clung to the Catholic church after her royal father had severed England from it, with the same fidelity that she remained loyal to her mother after Henry's unjust divorce.

When her young brother died, after his brief reign, almost all England rejoiced that the attempt to put Lady Jane in Mary's place as the heir was defeated (see Grey, Lady Jane). Indeed, at her accession Mary was one of the most popular rulers that England ever had; though at the end of her reign she was one of the most hated, and has gone down in history with the gruesome name of "Bloody Mary." In part her loss of popularity was due to her marriage with Philip II of Spain, the champion of the Catholic party in Europe. Englishmen generally disliked this marriage, partly because they were foolishly jealous of foreigners, but still more because they feared that it would force England to take an active part in the wars between France and Spain. These fears were justified, and in the struggle England lost Calais, which had been an English outpost since the days of Edward III. This was a great grief to Mary, who in her last illness declared that when she was dead "Calais would be found graven on her heart."

But most of Mary's unpopularity came from her religious persecutions. She caused the religious laws of her father's and brother's reigns to be repealed. The Catholic religion and the authority of the pope were thus restored. The laws for punishing heretics were also revived, and about 277 Protestants suffered death for their religion, as some Catholics had done in the reign of Henry VIII. The most notable victim of this persecution was Archbishop Cranmer of Canterbury, who had granted Henry VIII his divorce from Mary's mother. Rowland Taylor, Nicholas Ridley, and Hugh Latimer were other notable Protestant martyrs. The result was a wave of horror and disgust which swept over England. In the midst of it all, Mary herself—childless, sick, neglected by her husband, one of the saddest figures of that age of conflict—died realizing the fruitlessness of her efforts.

#### The Popular Queen Mary II

MARY II was a Stuart, the elder daughter of James II (born in 1662), and became joint sovereign of Great Britain with her husband, when the Revolution of 1688 drove her father from the throne (see James, Kings of England; William, Kings of England). The administration was left exclusively in the hands of her husband, William III, but it was Mary who made the reign popular by her youth, good heart, and pleasing manners. After her unfortunate death from smallpox, after only six years of reign, leaving no children, William III as a foreigner and one of cold reserved temperament had a much more difficult task to face than when aided by his wife.

## The TRAGIC STORY of MARY, QUEEN of SCOTS

*The Romantic Career of the Bewitching Woman Who was Queen in Two Countries—  
How She Played with Fate and Lost the Scotch Throne and was Finally  
Put to Death by Her Cousin, Queen Elizabeth*

MARY STUART, QUEEN OF SCOTS (1542-1587). It was with tears and heartbroken cries of farewell, according to the oft-told tale, that Mary Stuart set sail from France to Scotland. A girl of 19, returning like an exile from Paradise to a childhood home for which she had not one affectionate thought—a queen approaching her throne as Cinderella might have crept back to her ashes!

Mary, the daughter of James V of Scotland and the French princess Mary of Guise, was born Dec. 8, 1542, just after the Scottish forces had been decisively defeated at Solway Moss in an attempted invasion of England. Seven days later the king died, leaving Scotland and its infant queen as prizes to be fought over, not only by England and France, but also by Scotch lords and clerics. The English demanded that the baby queen should be pledged to marry Prince Edward, heir to the British throne, but the Scots decided to maintain the French alliance and chose the French heir as her future husband.

Even in childhood, the "enchantment whereof men are bewitched" was manifest in her. "This small Queen of Scots," wrote her mother-in-law, Catherine de Medici, "has only to smile in order to turn all French heads." Married to the Dauphin in 1558, at the age of 15, Mary became queen of France, as well as of Scotland, when her husband ascended the throne as Francis II in 1559. A year and a half later she was a childless widow, and the necessities of politics required that she leave the dissolute court of France, no matter how sadly, for her Scottish home.

But the Scotland to which she returned was very different from the one she had left. Her mother, who had acted as regent, had just died; the French interest had waned as the English power under Elizabeth had grown, and the Protestant Reformation for which John Knox and others had long labored was now triumphantly established.

Mary looked upon Protestant Scotland as no more than a pawn to be used in strengthening her position in England. As the granddaughter of Henry VIII's elder sister, Mary was heiress to the crown of England if, as Catholics claimed, Queen Elizabeth was barred as illegitimate. Mary's second marriage, in 1565, to the feeble and futile Henry Stuart, Lord Darnley, who also had pretensions to the English crown, was meant to strengthen this claim.

But Darnley's weak insolence and Mary's staunch attachment to Catholicism produced discord between



MARY STUART

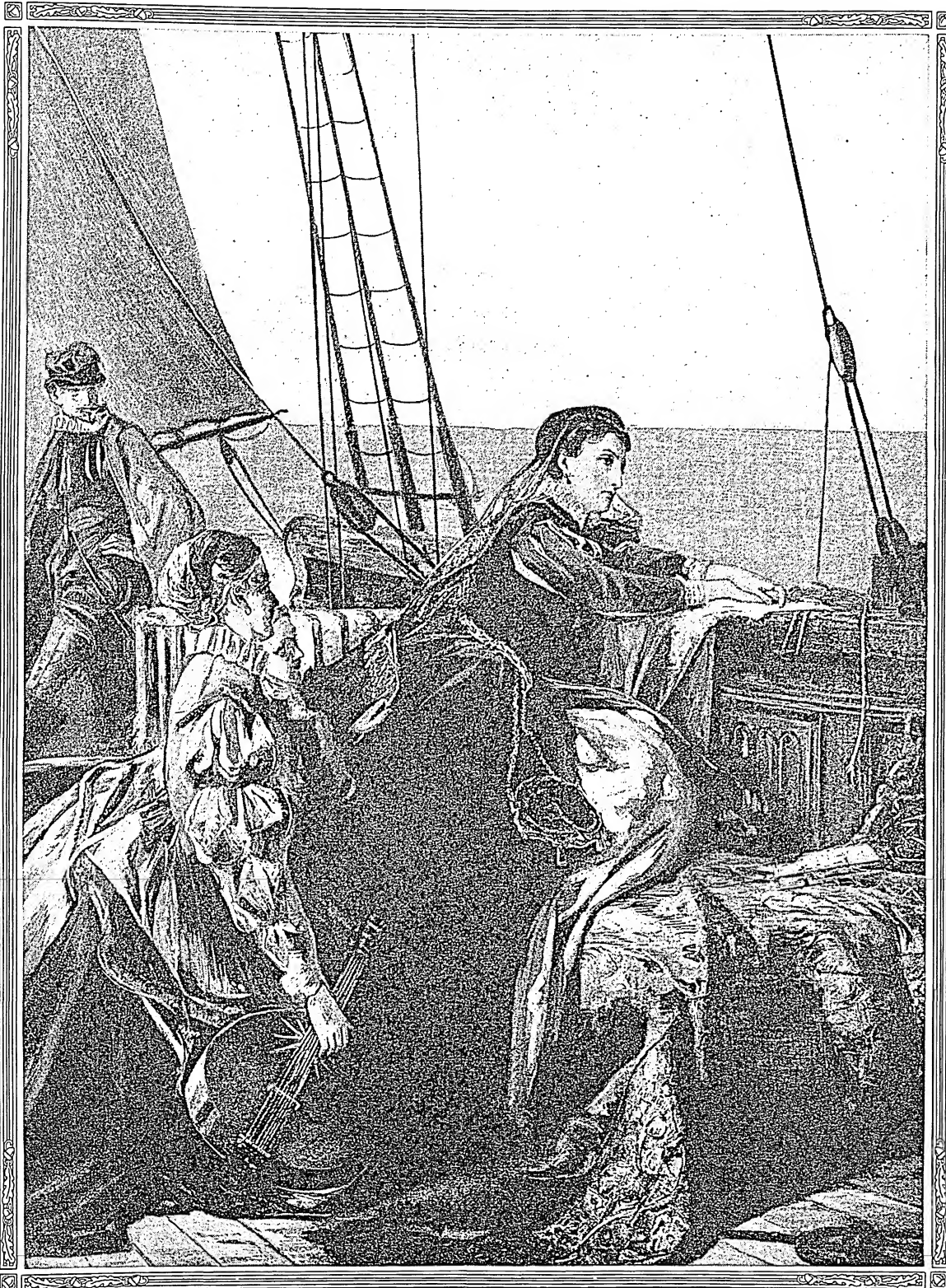
her and her Protestant subjects. Darnley's natural jealousy was fostered by many Scotch lords, Mary's enemies, who pointed to the rapid advancement with which the queen favored her low-born Italian secretary, David Rizzio. Darnley became a party to a conspiracy of nobles, which resulted in Rizzio's murder in Mary's presence. The outraged queen concealed her wrath at this cruel violence. She pretended to pardon Rizzio's murderers, and even flattered Darnley into complete reconciliation. June 19, 1566, Mary's son—afterward James VI of Scotland, who became James I of England—was born. Then in Febru-

ary 1567 she induced her husband, who was ill with smallpox, to take up his residence in an old house at Kirk-o'-Field, near Edinburgh. One night the house was blown up and Darnley's body was found near by next morning.

Suspicion against the queen seemed confirmed when, three months and six days after the unpunished murder, Mary married the Earl of Bothwell, who had been exposed as the chief of Darnley's assassins. "Burn her! Kill her! Drown her!" rang through the streets. Bearing before it a banner on which was painted a picture of her son praying for vengeance on his father's murderers, a rebel army took her prisoner at Carberry Hill, June 15, 1567. While Bothwell fled to Denmark, Mary was forced to abdicate in favor of her son, James. Escaping from prison at Lochleven, May 2, 1568, she hastily rallied a small army. When this was defeated May 13 by the regent Murray's forces at Langside, near Glasgow, Mary fled to England and cast herself upon the mercy of her cousin, Queen Elizabeth, who made her a prisoner. The famous "Casket Letters," supposedly written by Mary to Bothwell and captured by her enemies after his flight, were considered evidence of her guilt, but recently they have been proved forgeries.

For the next 19 years Mary's name was constantly involved in plots for escape and for the overthrow of Elizabeth. The Babington conspiracy in England was only the last and fatal link in a series which at length induced Elizabeth to bring Mary to trial. She was convicted of complicity in the plot for Elizabeth's assassination. So long as Mary lived there could be no safety for Elizabeth, and at last she was prevailed upon by her councilors to sign the death warrant. On Feb. 8, 1587, Mary Stuart, arrayed in black velvet and bearing herself as befits a queen, was beheaded on the scaffold in Fotheringay Castle.

## QUEEN MARY'S FAREWELL TO FRANCE



After the death of her husband, King Francis II of France, Queen Mary reluctantly gave up the gay life of the French court to return to her troubled throne in Scotland. We see her here on shipboard gazing sadly at the receding shores of the land she loved so well. It seems as if the artist sought to show that the unhappy queen already had a presentiment of the tragedies that were soon to overwhelm her.



"Cease to lament," were her last words to her weeping attendants, "for you shall now see a final end to Mary Stuart's troubles. I pray you take this message when you go—that I die true to my religion, to Scotland, and to France." So ended in tragedy one of the stormiest, and yet most romantic and fascinating, careers known to history.

The spell of Mary Stuart's charm rises up out of her grave and reaches across the centuries. Not yet have men ceased to wrangle over her guilt or innocence. The stormy splendor of her tragic fate, her courage and high pride in the face of her enemies, have been a never-ending inspiration to poets and writers of romance. (See Knox, John; Scotland.)

## GLORIES OLD AND NEW of "Maryland, My Maryland"

**MARYLAND.** Heir to a queen's name and warden of the imperial highway of Chesapeake Bay, with Mason and Dixon's line for its northern boundary, Maryland is like Virginia—but with a difference. Tidewater, piedmont region, and mountains are found also in Maryland, but on a smaller scale, and all are but a setting and background for the upper reaches of the majestic Chesapeake.

As in Virginia, the tidewater region (here nearly half the state) is low and threaded with navigable streams, which enabled the colonial planter to ship from his front door, or at least to send his tobacco, down to the landing in hogsheads, each pierced with an iron axle and dragged by a strong mule over a "rolling road." Even yet the tidewater farms and plantations mostly turn their backs on the roads and face the water.

The "western shore" (the peninsula between the Potomac and Chesapeake Bay) still raises considerable tobacco, though truck-farming and fruit-growing have become more important occupations. It is a conservative region, where stray remnants of manorial life and colonial customs are of comparatively recent memory. The inhabitants in the main cling to the ancient faith (Roman Catholicism) of the first colonists who landed in 1634.

The "eastern shore" (Maryland portion of the peninsula between Chesapeake and Delaware bays) has a somewhat more mixed population. While it raises a variety of crops, including fruit, vegetables, wheat, and corn, its boast is the quantity and, still more, the quality of the choice table delicacies which it produces. The reedy marshes along the shore swarm with ducks, among them the delectable canvasback, and the waters of the Chesapeake with fish—80 edible species, the finest being the Spanish or bay mackerel, the pompano, and the shad. The epicure's joy, the diamondback terrapin, hides in

*Extent.*—East to west, 240 miles; north to south, 128 miles (least width, about 3 miles). Area, 10,577 square miles, of which 690 are inland water. Population (1940 census), 1,821,244.

*Natural Features.*—Low tidewater region rising to a central piedmont region and the Blue Ridge and Allegheny mountains (highest point, Backbone Mountain, 3,340 feet). Chesapeake Bay divides the state into two parts. Principal rivers: Potomac and Susquehanna. Mean annual temperature, 54°; mean annual precipitation, 41".

*Products.*—Clothing, petroleum refining, canned goods, iron and steel, meat packing, machinery, stone, clay, and glass products, leather goods, aircraft, railroad cars, ships, fertilizers; wheat, corn, hay, tobacco, fruits, vegetables; cattle and dairy products; coal, clay, sand and gravel; oysters, fish.

*Cities.*—Baltimore (859,100), Cumberland (39,483), Hagerstown (32,491), Frederick (15,802), Annapolis (capital, 13,069).

the mud. One whole town (Crisfield) and half the population of Somerset County, in which it is situated, are engaged in oyster fishing and packing. Nor are they the only town and county on the eastern shore where the oyster industry is important; while (to leave the eastern shore for a moment) Annapolis is a center of the oyster trade, and whole streets are devoted to it in Baltimore. Soft- and hard-shell crabs, white clams, and sea turtles are also caught and shipped from the eastern shore. Wasteful methods of hunting and fishing have diminished the supply of many of these species; but

some, shad and terrapin, for instance, are now being artificially cultivated. (See Chesapeake Bay.)

The hill or piedmont region of middle Maryland, comprising something like a 40-mile belt across the inland neck of the state, with its western border at the foot of the Blue Ridge, is a substantial farming country, raising fine wheat and grass, particularly where the limestone foundation crops up near the surface of the clayey soil. It also produces fine apples, peaches, and small fruits, corn, and live stock. It is well wooded and threaded with many impetuous little cascading streams, known locally as "runs," which furnish considerable

water power. It is truly "the garden of the Lord," as Whittier called it in 'Barbara Frietchie'. Many of Maryland's mineral products—such as building stone—come from the piedmont belt.

The little ragged strip of mountainous Maryland, running westward from the Blue Ridge to the Alleghenies, contains superb scenery. The eastern part of this section is the fertile Hagerstown or Cumberland Valley, part of the Great Appalachian Valley. Farther west, where the topography becomes more rugged, most of the crop lands are in the river valleys, and subsistence farming prevails. Lumbering and coal mining are important industries.

### MARYLAND'S PRODUCTS



By far the greater part of the state's wealth comes from its many and diverse manufacturing industries.



Little Maryland, with about a quarter of Virginia's land area, has over half as large a population, and one city, Baltimore, which exceeds in size Virginia's ten largest cities put together. Why is this? It would almost seem as if metropolitan and commercial greatness had been forced on reluctant Maryland. As in Virginia, towns were created in colonial days by royal decree, but most refused to live. So unappreciative of commercial opportunities were the early Marylanders that the owner of the land on which it was first proposed to build the city of Baltimore turned the future metropolis away from his doorstep.

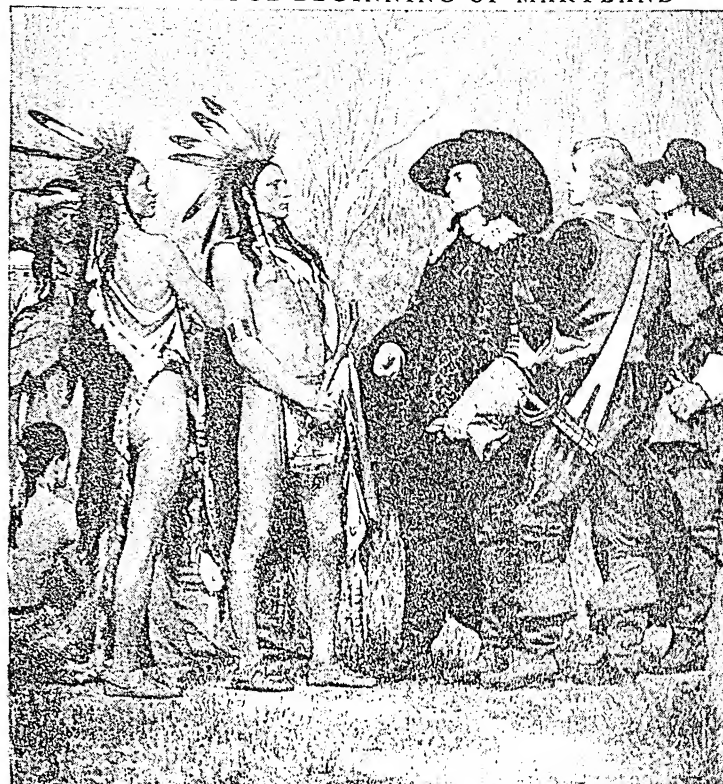
#### The Call of the Sea

But the imperious sea called, and would not suffer a home-loving people to sit quiet by their own firesides. By 1812 Baltimore "clippers" were famous ships all over the world; the South and the West, from Knoxville to Cincinnati and Pittsburgh, drew their supplies from the Chesapeake. Baltimore was then the first maritime city of the country, and growing like a miracle. Then other cities, with harbors not so far from the open Atlantic, swung into the lead. The foresight of Maryland citizens, however, retrieved on land much of the advantage lost on sea. The city's answer was the building of the Baltimore and Ohio Railroad, for which ground was broken in 1828, three years after the opening of the Stockton and Darlington Railroad in England. It was opened in 1830 with 14 miles of rails joining Baltimore and Ellicott Mills—the first railway built in America to carry both passengers and freight. The real objective—to link Baltimore with Wheeling, W. Va.—was achieved Dec. 24, 1852. By 1886 the line had reached St. Louis, Chicago, and Philadelphia. Another factor in developing the state was the Chesapeake and Ohio Canal, built between 1828 and 1850, stretching for 186 miles between Cumberland, Md., and the Potomac River at Washington, D. C.

The important products of Maryland include iron and steel manufactures, men's clothing, canned and preserved fruits, vegetables, oysters, crabs, and other sea foods, foundry and machine-shop products, flour and grist-mill products, lumber, cigars and cigarettes, and fertilizers. The cheap shipping facilities of Chesapeake Bay make Maryland one of the most important states in the canning industries. After Baltimore, Cumberland and Hagerstown are the most important manufacturing cities (see Baltimore).

Coal, bituminous and semi-bituminous, is the most important mineral product. The latter ranks high in steam-making power. Other important minerals are potter's and fire clay, sandstone, marble, granite,

#### THE PEACEFUL BEGINNING OF MARYLAND



This mural painting by Charles Yardley Turner in the Baltimore court house shows Leonard Calvert, Maryland's first governor, buying from the Indians the land for the first settlement. The fair and tolerant attitude of the new colony accounted for the peace that prevailed there during its early years.

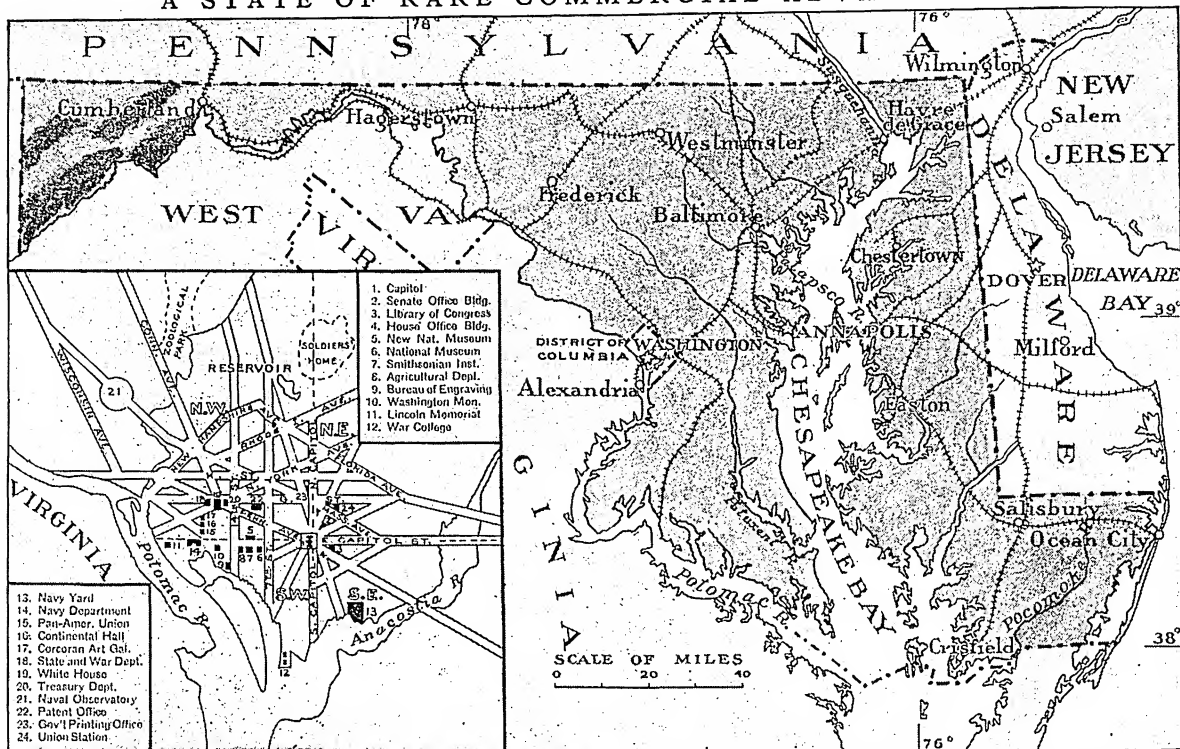
roofing slate, brick, and kaolin. The discovery of better iron and copper ores in other parts of the country has made the operation of the Maryland mines unprofitable. One of the greatest hydroelectric plants in the country is the Conowingo installation, near the mouth of the Susquehanna River. It occupies the old site of the town of Conowingo, Md. Its output is carried over high voltage lines to Philadelphia, some 75 miles distant. A highway running across the top of the dam, more than 100 feet above the foundation, is part of a main road between Baltimore and Philadelphia.

#### The History of Maryland

Spanish adventurers first entered the Maryland country about 1525, some historians believe. Capt. John Smith, leader of the Jamestown settlement of the Virginia Colony, charted the Chesapeake Bay region in 1608, and journeyed up the Potomac River to Georgetown. (See Smith, Captain John.)

In 1631, William Claiborne and other Protestants from Virginia established a trading post, the first settlement within the limits of Maryland, on Kent Island on St. Mary's River, close to the junction of the Potomac with Chesapeake Bay. They, with others, protested the granting of a charter by Charles I to George Calvert, the first Lord Baltimore, who wished to found a colony in America for his fellow

## A STATE OF RARE COMMERCIAL ADVANTAGES



AGRICULTURE	MANUFACTURING	TRADE AND TRANSPORTATION	OTHER OCCUPATIONS
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Roman Catholics in England. The charter was granted but Lord Baltimore died before the patent was actually issued, and it was given to his son Cecil, the second Lord Baltimore, in 1632. Nearly two years passed before Cecil Calvert sent out the first group of colonists, led by his brother Leonard Calvert, to the grant of lands which embraced the present state of Maryland and parts of Pennsylvania and Delaware. It was named "Maryland" in honor of King Charles' wife, Henrietta Maria. Although Governor Calvert had been given the land by Charles I, he formally purchased it from the Indians. Payment was made in cloth, axes, hatchets, knives, and hose.

From the outset, Governor Calvert welcomed not only Catholic colonists but also those who were non-Catholic Christians. In 1649, Maryland passed an Act of Toleration, according liberty of worship to all trinitarian Christians—the first religious toleration act passed on American soil.

In 1650, Puritans from Virginia Colony made a settlement at Providence (now Annapolis), and with the help of Claiborne succeeded in getting the English Commonwealth to depose the Lord Proprietor from 1654 to 1658. In 1688, they again gained supremacy, and in 1692 Maryland became a Royal Colony. In 1715, the fourth Lord Baltimore, a Protestant, was made proprietor and from that date to the time of the

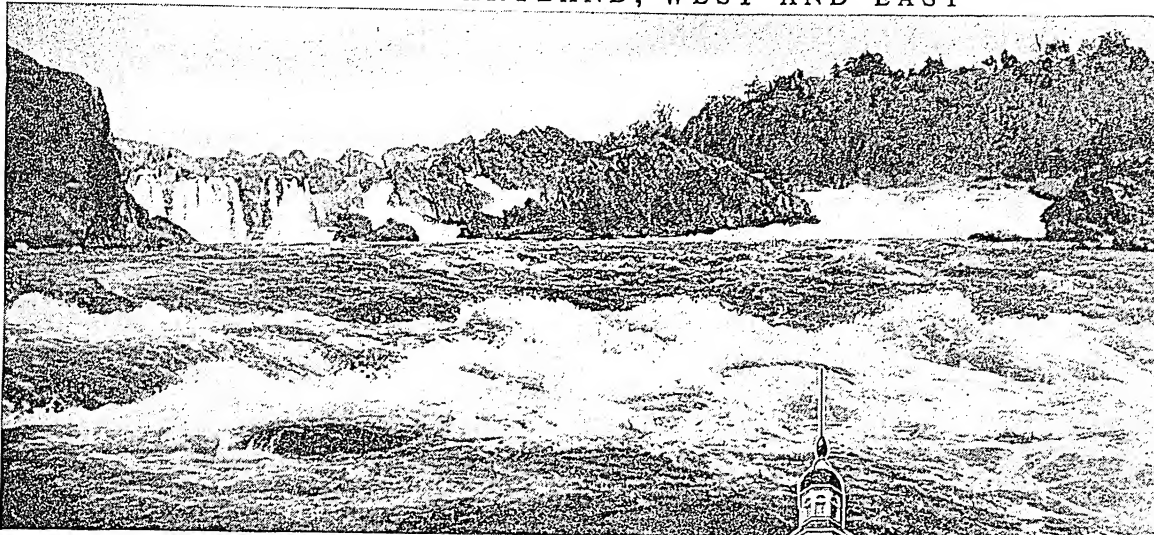
In the early days of the nation the open road to the sea down Chesapeake Bay drew Maryland inevitably into world-wide commerce, and "Baltimore clippers" were known throughout the seven seas. When railroads were invented, Maryland was one of the pioneers. This progressiveness has always kept the state in an important place. Embracing as it does the District of Columbia, Maryland is at the very heart of the nation's affairs. The smaller map to the left shows the principal streets of Washington, together with the most important buildings. Notice the avenues radiating from the Capitol and White House.

Revolution, the Church of England was the established church and everyone was taxed for its support. A dispute with Pennsylvania over the northern boundary line was settled in 1763-67 by the survey of Mason and Dixon's line (see Mason and Dixon's Line).

On Oct. 19, 1775, Maryland answered the British tax on tea by burning the *Peggy Stewart* and its cargo of tea in the harbor at Annapolis. Marylanders still celebrate "Peggy Stewart Day." John Eager Howard was the hero of the Revolutionary battle of Cowpens. He became a governor of the state and a United States senator. In 1776, the Continental Congress fled to Baltimore from Philadelphia. Washington resigned his commission as commander-in-chief of the Continental army in the old senate chamber of the State House at Annapolis on Dec. 23, 1783.

Maryland delayed signing the Articles of Confederation until 1781, because it wanted the western lands to be ceded to the Union (see Northwest Territory). It ratified the Constitution in 1788 and gave 60 square miles of its territory, which later became a part of the District of Columbia, for the federal capital. During the War of 1812 Maryland was exposed to attack by the British fleet and army, and the bombardment of Fort McHenry in 1814 was the occasion

## VIEWS IN MARYLAND, WEST AND EAST

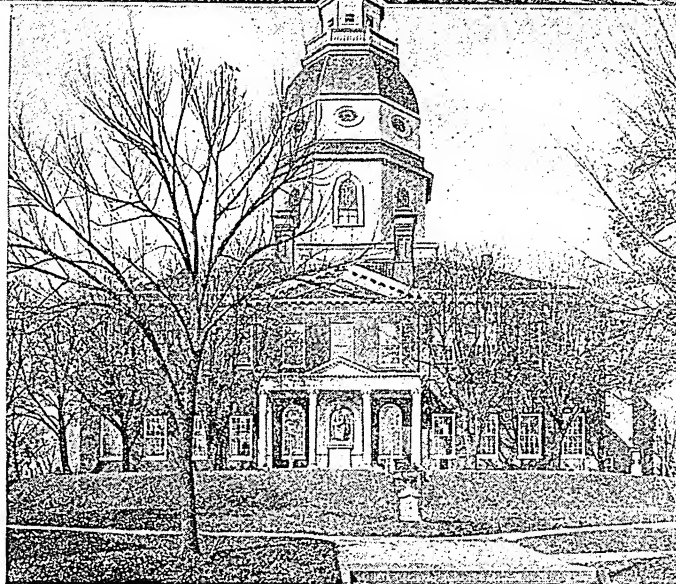


A few miles above Washington are the Great Falls of the Potomac, where the river tumbles down 80 feet over a rough ledge and forms a picturesque series of rapids below. The old state capitol at Annapolis, shown in the lower view, was commenced in 1772. It has been rebuilt recently.

for the writing of 'The Star-Spangled Banner' by Francis Scott Key. The first line of electric telegraph in the United States was run from Baltimore to Washington in 1844. Maryland's sympathies during the Civil War were divided, but though a slaveholding state, it adhered to the Union. The battle of Antietam took place on its soil. A new constitution adopted in 1864 abolished slavery.

#### Many Distinguished Citizens

Maryland has a long roster of distinguished citizens. Margaret Brent, heir and executrix of Gov. Leonard Calvert, was a pioneer suffragist, who asked permission to vote in the Assembly, but was denied it (*see Women's Rights*). James Rumsey, a native of Cecil County, invented a pump-driven steamboat which made a trial trip at Harper's Ferry more than 20 years before Robert Fulton launched the first wholly successful steamboat on the Hudson River in 1807. Stephen Decatur, the great naval commander, was a native of Worcester County (*see Decatur, Stephen*). One of the world's great actors, Edwin Booth, was a native of Harford County. The last living signer of the Declaration of Independence, Charles Carroll, was a native of Maryland. Mason Weems, born in Calvert County, was the popular biographer of George Washington who first wrote the story of the youthful Washington, the hatchet, and the cherry tree. Charles Wilson Peale, who made several fine portraits of Washington, was a leading painter of the Revolutionary period. James Ryder Randall, a native of Baltimore, wrote 'Maryland, My Maryland' when he read that the Sixth Massachusetts



Infantry had been attacked while marching through the streets of Baltimore.

Maryland men of wealth have given generously of their money for libraries and educational institutions. George Peabody not only saved the credit of Maryland during the financial stress of 1836, but later endowed various public institutions. Johns Hopkins, a native of Anne Arundel County, left in 1873 an estate of \$7,000,000, to found the famous university in Baltimore which bears his name. The first school for graduate study in America was started here in 1876, and the university did much to transform American training in medicine. Pratt Library in Baltimore is named after Enoch Pratt, a wealthy merchant, who gave over a million dollars to found it.

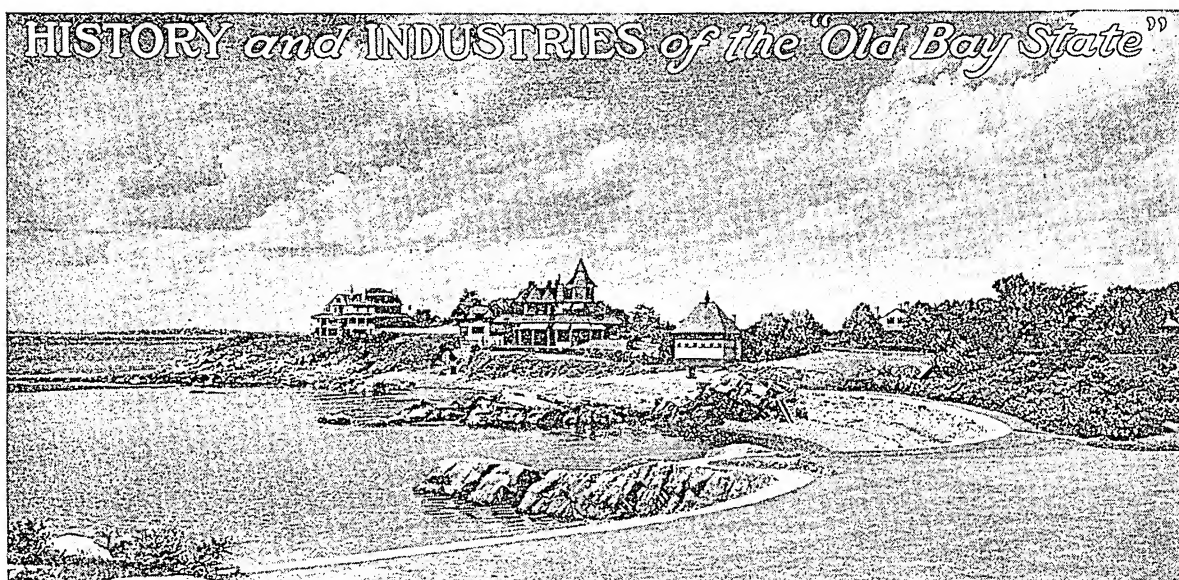
Edgar Allan Poe, the famous writer, lived in Baltimore for several years. Teachers and pupils of the



city have erected a monument to him in Westminster Churchyard. The poet Sidney Lanier was a flutist in the Peabody Symphony Orchestra in Baltimore, and lecturer at Johns Hopkins University. Maryland also claims F. Hopkinson Smith, novelist, and Henry L. Mencken, critic and essayist. Roger Brooke Taney, chief justice of the United States Supreme Court which handed down the Dred Scott decision, and Winfield Scott Schley, second in command at the battle of Santiago in the Spanish-American War, were native sons. Mrs. Wallis Warfield Simpson, who became the Duchess of Windsor when King Edward VIII surrendered the British crown to marry her, was born in Baltimore.

Educational institutions include Johns Hopkins University and Goucher College, both at Baltimore; the University of Maryland at College Park and Baltimore; United States Naval Academy at Annapolis; teachers colleges at Frostburg, Towson, and Salisbury; and the Maryland Normal School (for Negroes) at Bowie.

**MASON AND DIXON'S LINE.** The original Mason and Dixon's line was the boundary between Maryland and Pennsylvania. In 1763 the two colonies, to settle a dispute that had continued since the days of Lord Baltimore and William Penn, appointed the English mathematicians Charles Mason and Jeremiah Dixon to fix the boundary. Mason and Dixon ran the line near the parallel of  $39^{\circ}43'$ . Part of the line was marked by stones, bearing on one side the arms of Baltimore and on the other those of Penn. Some of these still stand. Later, when slavery was abolished in states north of the Mason and Dixon line and prohibited in territory north of the Ohio River, the name was popularly given to an extension of the original line following the Ohio River to Missouri, then around the southern part of Missouri, and then along the parallel of  $36^{\circ}30'$  (see Missouri Compromise). "Dixie," a name for the South, may have come from "Dixon's line."



A Glimpse of the Picturesque Massachusetts Shore Line near Nahant

## MASSACHUSETTS.

The wave-battered coast of Massachusetts turns a hard face to the sea. No stretch of fertile plain breaks its grim front of barren rocks and sand. No great valley opens invitingly into a gentle hinterland. Its shores have been sinking through the ages, and rugged cliffs or low sand dunes mark much of the coast line. It is a land that demanded rare strength and courage of the men and women who came to conquer it three centuries ago. Dark forests stood guard behind the cliffs, and the thin soil, strewn with glacier-deposited boulders, discouraged agriculture. Winters are long

*Extent.*—North to south, 130 miles; east to west, 184 miles. Area, 8,257 square miles. Population (1940 census), 4,316,721.

*Natural Features.*—In the west, Berkshire Hills (Mt. Greylock, 3,505 ft.), Hoosac Range (Spruce Hill, 2,588 ft.), Mt. Tom (1,214 ft.), Mt. Holyoke (954 ft.). Connecticut, Merrimack, Charles, and Housatonic rivers. Cape Cod peninsula and Cape Ann; Cape Cod and Buzzards bays; Martha's Vineyard and Nantucket islands. Mean annual temperature,  $46^{\circ}$ ; mean annual precipitation,  $41''$ .

*Products.*—Woolen, cotton, and other textiles, boots and shoes, electrical machinery, clothing, leather goods, ships, jewelry, paper, printing and publishing; hay, potatoes, cranberries, onions; cattle and dairy products; cod, haddock, and other fish; granite.

*Cities.*—Boston (capital, 770,816), Worcester (193,694), Springfield (149,554), Fall River, Cambridge, New Bedford, Somerville, Lowell, Lynn, Lawrence (all over or near 100,000).

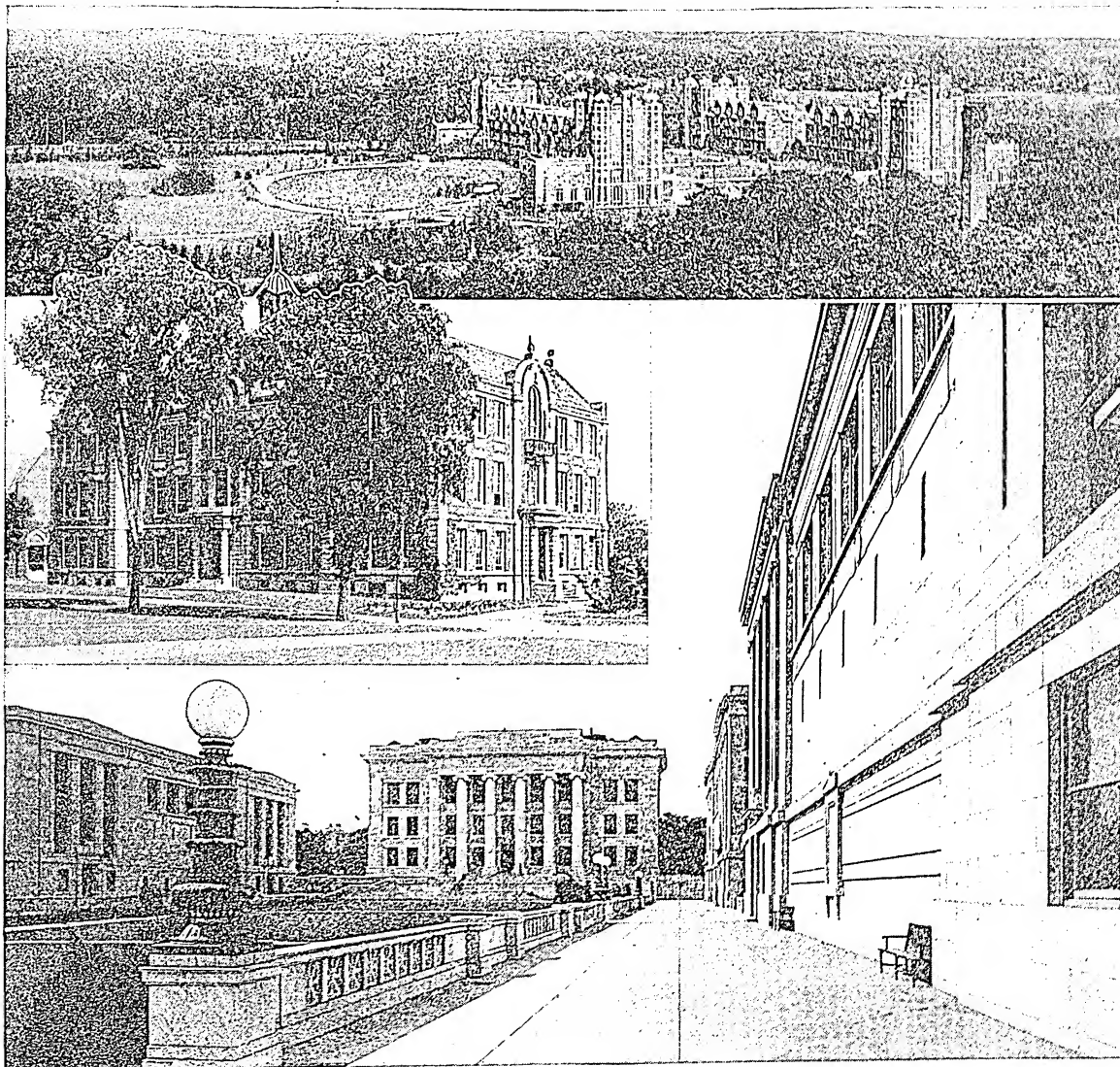
and often bitterly cold. Yet the first settlers, undaunted, wrested a livelihood from this unfriendly land, and established a civilization.

The coast is a treasure house of history. The Pilgrims in 1620 first landed near Provincetown

at the tip of the Cape Cod peninsula. Their permanent settlement was made across the bay at Plymouth. A few miles to the north, at Duxbury, John Alden and Miles Standish built their homes. In Quincy, Boston, Salem, Marblehead, and Gloucester, the story of the 17th century may still be read in old houses, old street names, old tombstones.



## SOME FAMOUS HOMES OF LEARNING NEAR BOSTON

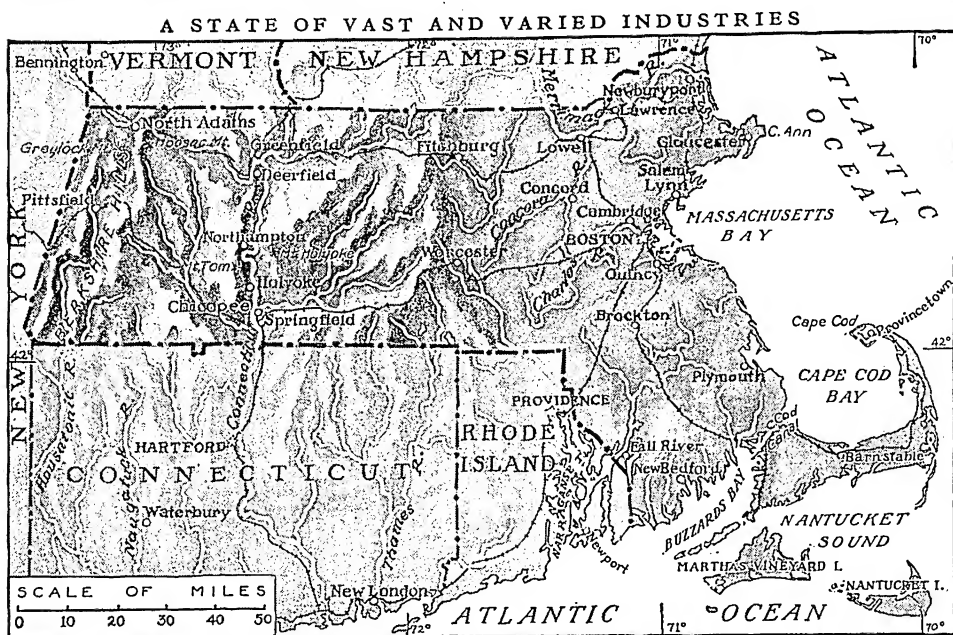


The upper view shows the "Quadrangle" at the famous Wellesley College for girls, near Boston. The four buildings surmounting the crest are dormitories, and the rest of the college buildings are mostly to the right of this group out of sight. The middle picture shows Seelye Hall, a recitation hall of Smith College at Northampton, another famous girls' college. The lower view shows a portion of the Harvard Medical School. The school occupies a site of 26 acres in Brookline, three miles from the main campus. The entire group comprises seven buildings, and in completeness of equipment they are exceeded by no medical school in the world.

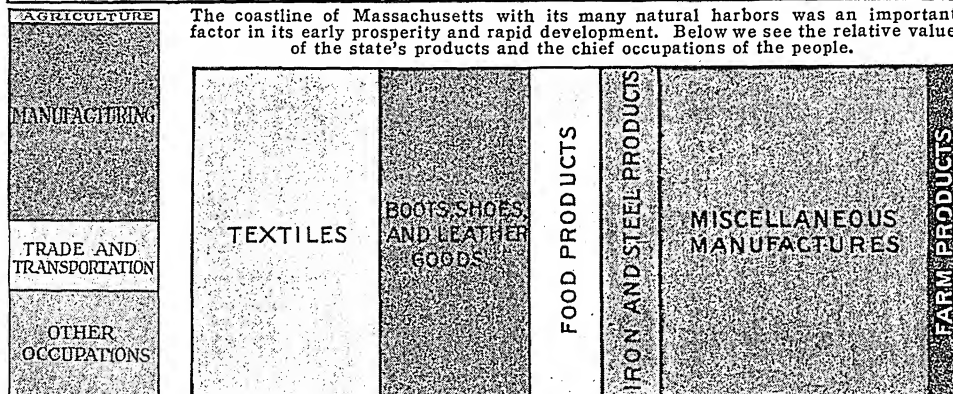
The place names, too, have their story to tell. Some, like Boston and Plymouth, tell of ports back in England; others, like Salem—which is another name for Jerusalem—remind you of the religious fervor which first brought Englishmen to these shores. Cambridge recalls that beautiful town in England from whose world-famous university more than 70 devoted men came to cast their lot with the settlers of Massachusetts Bay between 1630 and 1650. Among them were Roger Williams, John Eliot, and John Harvard—the latter the founder of the famous university that bears his name in the new-world Cambridge. Other historic place names commemorate early colonial celebrities, while still others are from

the Indian tongue. The name Massachusetts itself comes from Indian words meaning "great hills place," and the name originally applied to a tribe of Indians living between Salem and Plymouth.

Side by side with this history-book Massachusetts is the new industrial Massachusetts, a state of great factories and bustling commerce. More than 90 per cent of the population live in cities or large towns. The shoe cities, especially Brockton, Haverhill, and Lynn, turn out a large part of the shoes produced in the United States. Boston makes machinery, clothing, confectionery, and many other products. Holyoke and Springfield make a large proportion of our fine writing papers. Lowell, Lawrence, New Bedford, and Fall



The coastline of Massachusetts with its many natural harbors was an important factor in its early prosperity and rapid development. Below we see the relative value of the state's products and the chief occupations of the people.



River are textile centers. The last two were long the greatest "mill towns" in the country. Today the South competes with New England in cotton manufacture, but Massachusetts still is a large producer of cotton goods as well as of woollens. Worcester is a cradle of inventions. It was the home of the men who invented the cotton gin, the carpet-weaving machine, and the sewing machine. It makes much of the wire, belts, and looms that keep the other factory towns going. Waltham has one of the largest watch factories in the world. Woburn produces leather, Gloucester is the great port for cod and mackerel fisheries, and Quincy keeps a large number of laborers busy in its granite quarries, which have been worked for many generations.

#### The Industries and the Foreign Population

This new Massachusetts has attracted a great many foreign workers, so that one-fourth of its inhabitants are now of foreign birth, and about two-fifths are of foreign parentage. In certain parts of the state are whole villages of French Canadians, workers in the cotton mills. The Italians employed in the cordage industry at Plymouth form a city of their own, that

elbows closely this historic town of the Pilgrims. The Portuguese are more and more taking possession of the fishing and cranberry industries of Cape Cod. Swedes and Finns man the granite quarries of Cape Ann. In Salem you would perhaps find a Polish family living in the house once owned by the man who first sent ships from America to India and China around the Cape of Good Hope. Where Paul Revere lived in Boston is now Little Italy. Most numerous are the Canadians, the Irish, and the Italians. The rigidity of 17th century Puritanism long ago disappeared from Massachusetts' life, and with this influx of foreign immigration the religious balance has passed

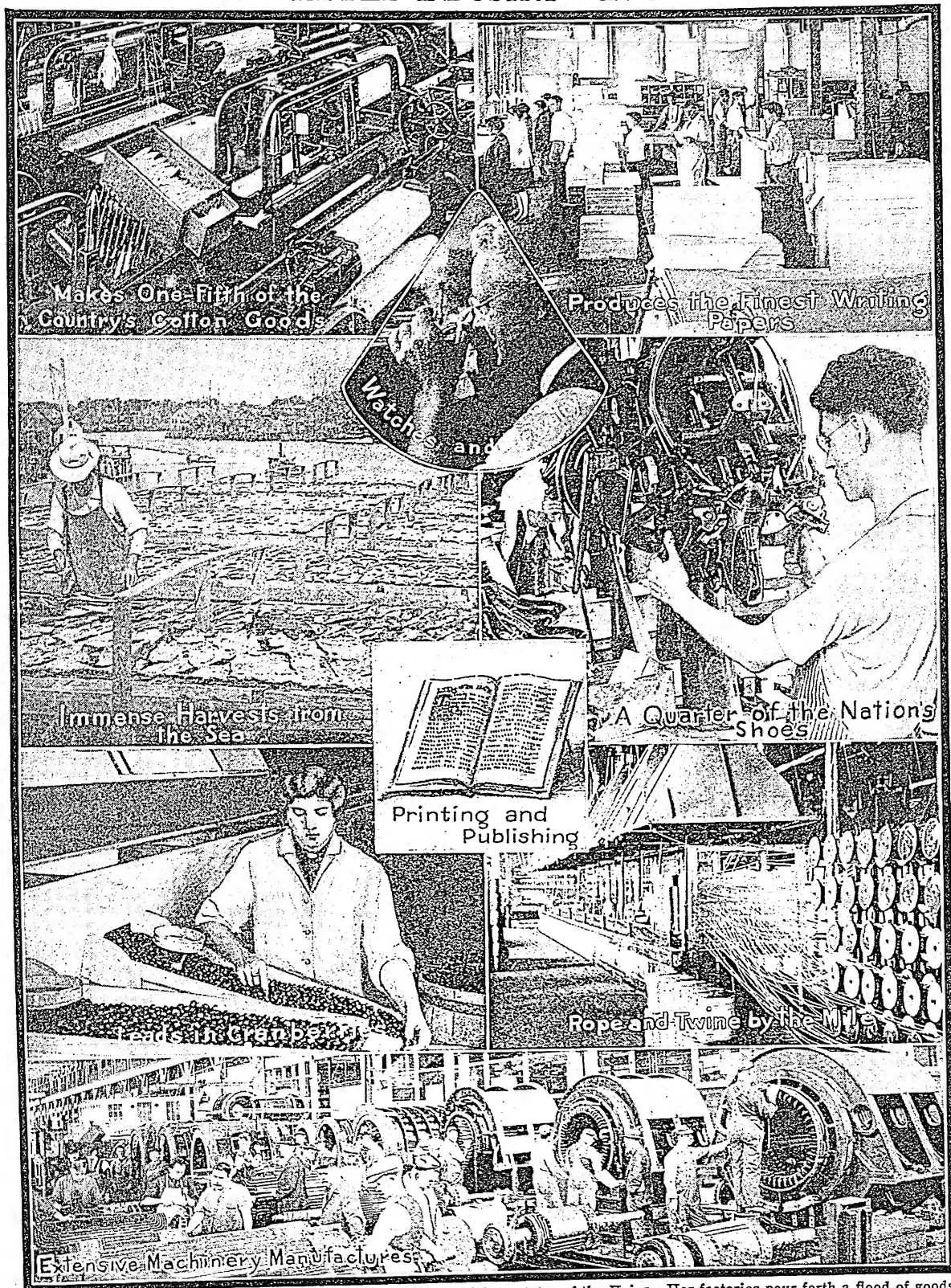
from Protestantism to Roman Catholicism.

Massachusetts has always been one of the richest states in the Union. Its wealth of late years comes chiefly from manufactures, but its early prosperity came from its fisheries. During their first winter, 44 of the Mayflower colonists died, and the rest would hardly have survived without the wholesome food caught off their shores. By 1633 the colonists had begun exporting fish. As the industry developed, their ships carried abroad the cod and mackerel caught on the Newfoundland Banks, and brought from Spain and the West Indies sugar and molasses, the latter used in making the famous Medford rum. So Massachusetts became a commercial center. In 1784 an enterprising Salem ship-owner sent a vessel to Russia, and a year later the romantic and profitable trade with China and the Orient began. Whaling, once a prominent industry of New Bedford and Nantucket, has now greatly declined.

Massachusetts is interesting not only for itself but also for the fact that it was the cradle of many American institutions and enterprises. The first free

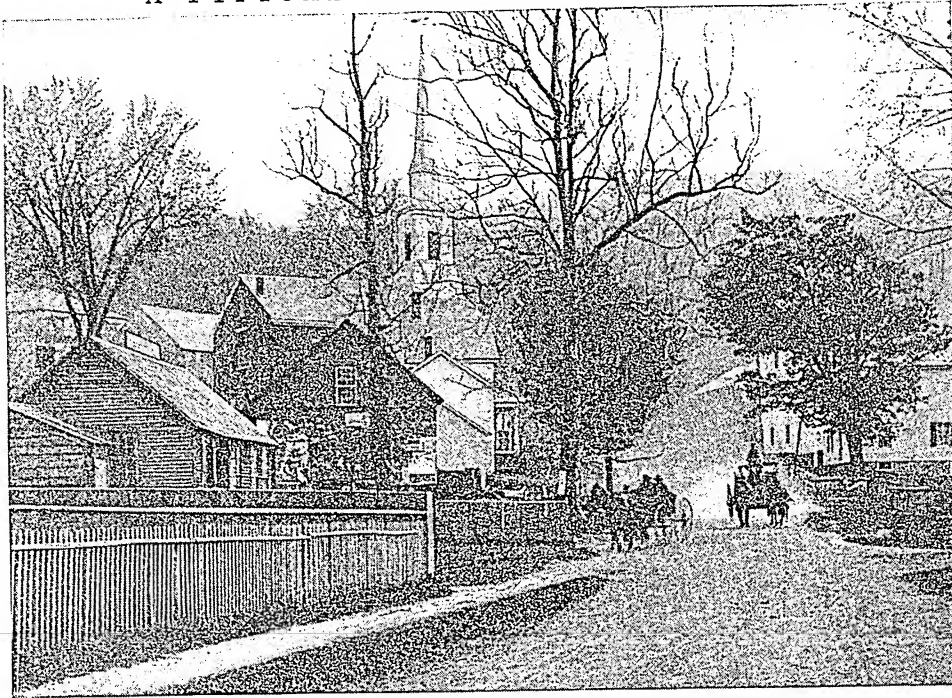


# GLIMPSES OF "YANKEE INDUSTRY" IN MASSACHUSETTS



These pictures show plainly why Massachusetts is one of the richest states of the Union. Her factories pour forth a flood of goods that many an entire nation cannot equal—paper, textiles, watches, shoes, machinery, rope and twine, books, and countless others. Among the older enterprises of the state, the fisheries still hold an important place.

## A TYPICAL NEW ENGLAND VILLAGE

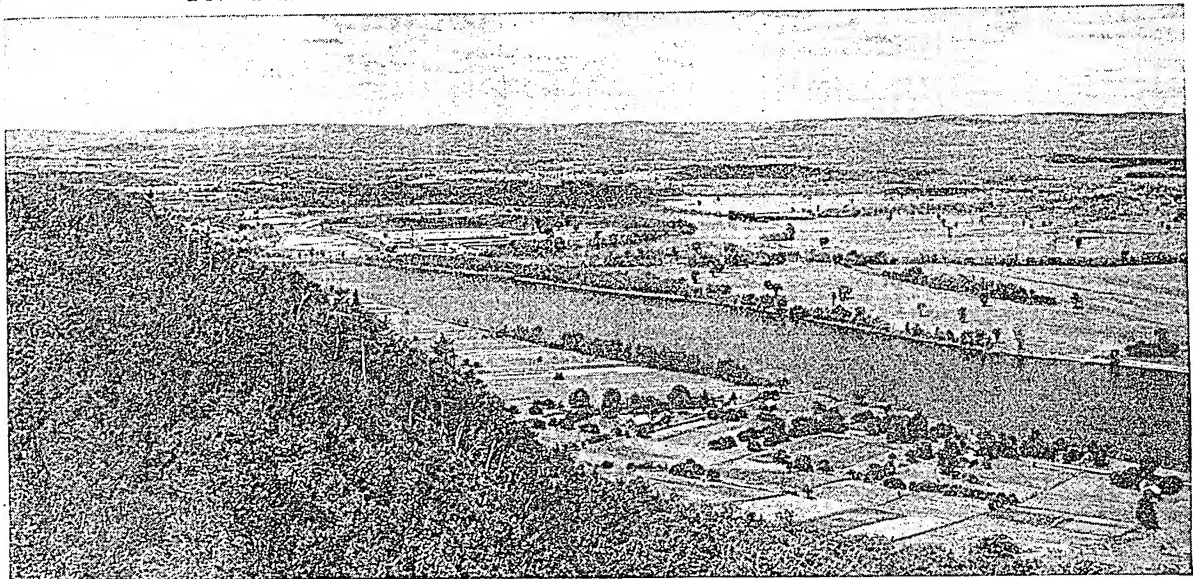


Who has not caught the spirit of the old farming communities of early New England days from the poems of Longfellow and Whittier? Here is one of these little towns, nestling in the low hills, with its old church to symbolize the sturdy religious faith of the early settlers, and its rambling streets flanked by modest wooden dwellings and picket fences.

public school was founded there in 1635, and 1636 saw the beginning of Harvard College. Massachusetts still continues to lead all the states in the number of its colleges and academies of high rank. The town meeting so widely used in local government was also

picturesque hill regions of America. Their green slopes, little lakes, and shallow stony brooks have often led to a comparison with the famous lake country of England. Summer resorts and great private estates occupy the more remote valleys.

## IN THE BEAUTIFUL CONNECTICUT VALLEY



It looks something like a checkerboard, doesn't it, with the fields laid out in little squares? The view was taken looking southwestward across the river valley from a hill near Northampton. The valley of the Connecticut River is one of the more favorable farming regions of the state.



## WHERE THE BATTLE OF LEXINGTON WAS FOUGHT



Everyone knows the story of the running fight that opened the American Revolution — how the farmers fired on the Redcoat column from behind fences, trees, and bushes until the British returned, badly battered, to Boston. This old stone fence near Lexington perhaps served to shelter its quota of Yankee marksmen on that historic day.

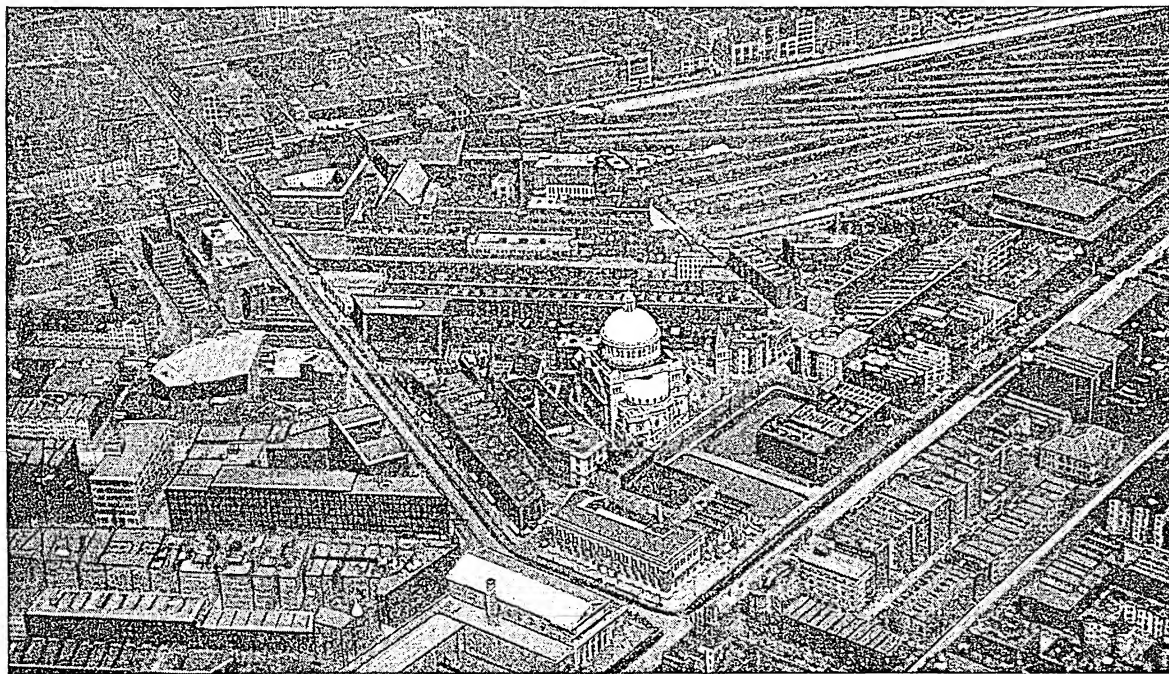
The hills and neighboring mountains give rise to a number of rivers, most of them not navigable, but valuable for manufacturing. Look at the map and you will see how close is the relation between the rivers and the great manufacturing centers.

The hills offer only a thin and stony soil, easily exhausted and hard to till, and therefore point not only toward manufacture but away from any very great development along agricultural lines. Massachusetts is more and more leaving the production of cereal crops to other states, although she is doing an increasing amount of market gardening and dairying.

Her many "abandoned farms" are a feature of the countryside. In 30 years, it has been estimated, the tilled land had been reduced one-third.

The sea-coast is as picturesque as the hills. Cape Cod, stretching out like an arm doubled at the elbow, is the most prominent feature of our whole Atlantic coast-line, and its quaint towns are favorites with the summer residents. For fishermen Cape Cod is like a great pier from which they may stretch their nets, and for Boston it forms a breakwater such as the commonwealth could never have built with any amount of money. A canal from Cape Cod to Buz-

## AN AIRPLANE VIEW OF BOSTON



This picture shows us one of the newer parts of Boston, southwest of the heart of the city. Even if you could not recognize the buildings, you would know from the long straight streets that this section had been built up since colonial days, for the older part of the city is a crazy-quilt of narrow winding thoroughfares. The domed structure in the center is the Mother Church of the Christian Science faith. In the upper right-hand corner are the freight yards of the Boston & Albany Railroad.

zards Bay now removes the dangers to coastwise shipping which have made the Cape a name of ill omen. The islands of Marthas Vineyard and Nantucket—the one about 23 miles long and the other 15—are outlying parts of Massachusetts. Until 1820 what is now the state of Maine was a part of Massachusetts, and for a time New Hampshire was joined to this greatest of the New England colonies.

In history and the literary and intellectual life of the country Massachusetts' part has been no less eminent than in its manufactures and commerce. What would the history of the colonies be without Bradford and Winthrop, and Cotton Mather; without James Otis, the Adamses, and John Hancock; without the "Boston Tea-Party," Lexington and Concord, and Bunker Hill? What voice has ever carried so far or with such weight in the nation's history as that of Daniel Webster? Where else in America can we find such a galaxy of literary lights as Longfellow, Whittier, and Lowell, Hawthorne and Holmes, Emerson and Thoreau, Bancroft, Prescott, Motley, and Parkman? The mere enumeration of the state's chief colleges and universities is impressive. After Harvard, came Williams, at Williamstown (1793); Amherst, at Amherst (1825); College of the Holy Cross, at Worcester (1843); Tufts, at Medford (1852); Massachusetts Institute of Technology, at Cambridge (1861); Massachusetts State College, at Amherst (1863); Clark University, at Worcester (1887); and for women: Mount Holyoke College, at South Hadley (1836); Wellesley College, at Wellesley

(1870); Smith College, at Northampton (1871); Radcliffe College, affiliated with Harvard; Simmons College, at Boston (1899).

The landing of the Pilgrims at Plymouth in 1620, the founding of Salem by Endicott in 1628, and the "great emigration" of John Winthrop and the holders of the Massachusetts Bay charter in 1630, mark the beginnings of the settlement. The banishment of Roger Williams, and the hanging of Quakers and witches are events of the Puritan rule which today are deplored. The colony charter was forfeited in 1684, and for several years Massachusetts suffered from the tyranny of the royalist governor Sir Edmund Andros. The Revolution of 1688 in England, however, brought relief. The Plymouth Colony and the province of Maine were annexed to the Massachusetts Bay Colony in 1692, under the new provincial charter granted in 1691. This charter reflected a marked softening in the older religious intolerance.

Massachusetts took a leading part in the resistance to the arbitrary measures of the mother country which led to the American Revolution. It was one of the first to erect an independent state government, but did not adopt a state constitution to replace its colonial charter until 1780. This was revised in 1851 and again in 1917, a moderate form of the initiative and referendum being included in the last revision. The ratification of the Federal constitution by Massachusetts in 1788, accompanied by the proposal of amendments, turned the balance in favor of that instrument and insured its adoption.

## *The MARVEL of MATCHES and How They are Made* *Little Sticks that Light Most of the World's Fires—Ingenious Machines that* *Produce Them by the Millions—Eight Matches a Day* *for Every One of Us*

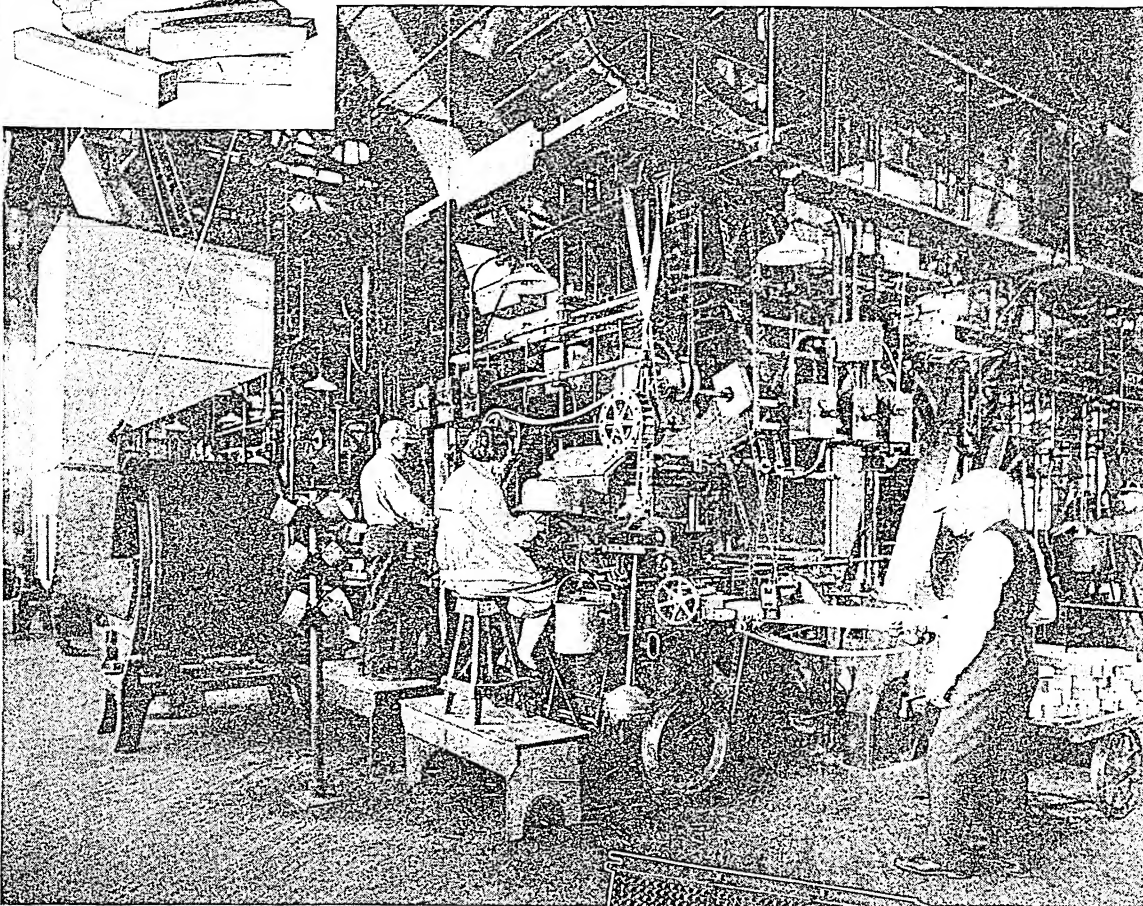
**MATCHES.** A hundred years ago it was a solemn thing to watch the father of the family start a fire. He took a little iron box down from the high mantel shelf. Inside of it were a bar of steel, a flint stone, and a bit of charred linen or "tinder." He struck the steel on the flint and a starry spark flew off on the tinder. Slowly the glow spread over the tinder until, by blowing on it and feeding it with shavings and splinters, sometimes tipped with sulphur, it burst into flame.

It was such trouble to start a fire with flint and steel that live coals were kept over night under ashes. If a fire went out a little boy was likely sent with an iron kettle to borrow fire of a neighbor a mile or so away. Hunters who lost their tinder boxes were sometimes forced to start camp-fires as the Indians did, by rubbing two sticks together. Any one who has got his supply of matches wet while on a camping trip will understand what a convenience matches are, and will understand why the practiced woodsman keeps his matches in a waterproof box or bottle, and guards them with even greater care than his food.

It had long been known that phosphorus, sulphur, and certain chemical compounds catch fire at low temperatures, but the friction match was not invented until 1827, and the first really practical matches were not put on the market until 1833. For many years most matches were tipped with a mixture of white phosphorus and sulphur, which gave off disagreeable fumes and took fire at very low temperatures. Since white phosphorus gives off highly poisonous vapors which produce the terrible "phossy jaw" disease once common in the match industry, its use has been prohibited in the leading countries of Europe and made impossible in the United States by heavy taxation (see Phosphorus). The inflammable tips now usually contain sesquisulphide of phosphorus, together with other substances that promote rapid combustion. "Safety matches," which will not easily ignite except when rubbed against the chemically prepared strip on the side of the box, are usually tipped with quick-burning chemicals such as chlorate of potash, while the phosphorus is in the mixture on the rubbing surface of the box. In some European countries "vestas"

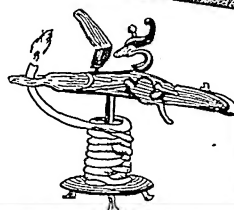


# THE MATCH BEGINS ITS JOURNEY



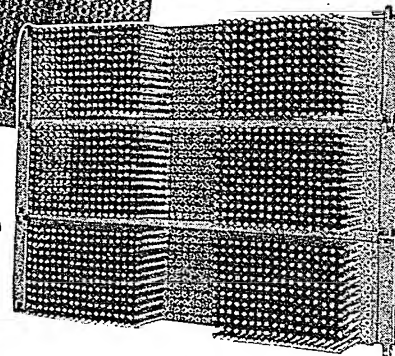
Look at this busy, complicated machine which is cutting match sticks out of wood blocks in the factory of a great modern match company. Then look at the little sketch of the savage grunting away as he twirls his bow drill to make a spark of fire. Or examine the drawing of the pistol lighter and tinder box, a cranky contrivance in use a hundred years ago. Then you will realize what a lot of trouble a match saves us, and how short a time the world has had this great convenience. Indeed, many savage peoples today still use the bow drill for making fire. As late as 1860 match sticks were made by hand, and the railroads were just beginning to accept matches for shipment. Before that time matches were always likely to go off like a Roman candle, leaving a bad smell of sulphur behind. The picture of the pile of wood blocks in the upper left-hand corner shows how the wood is prepared before it is fed into the machine in the large picture. This machine not only cuts the blocks into match sticks at very high speed but plants each of them endwise in a sieve-like plate of metal, full of little round holes just the right size to hold the matches firmly. If you examine American-made matches intended for kitchen use you will notice the mark at the end of each match where it was held in this device. The photographs at the lower right show two of these plates, one empty, the other full of match sticks ready to ride along through the giant machine.

Making  
Fire  
with  
Bow  
Drill

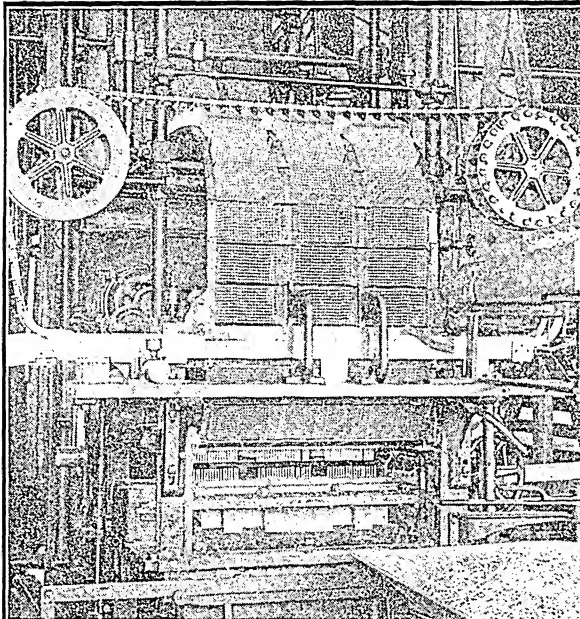


Pistol Lighter and  
Tinder Box

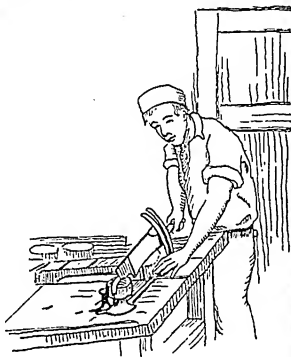
The old pistol lighter at the right was a great convenience in the days before matches were invented. Pulling the trigger released a clockwork which turned a grooved steel plate against a flint, producing sparks to ignite the tinder.



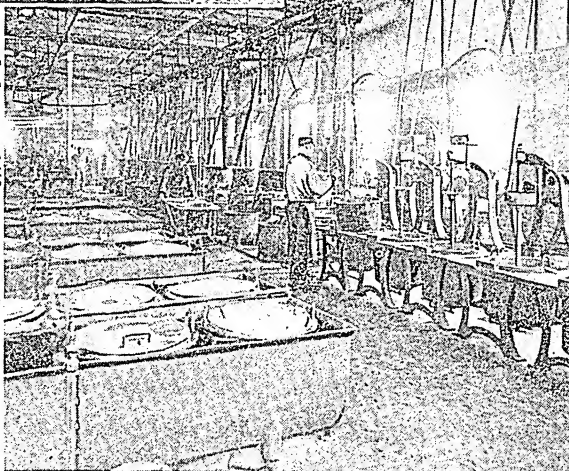
## WHERE THE SPLINTS ARE DIPPED AND TIPPED



After the crunching knives of the splint-cutting machine have done their work, the matches stand up on end in the metal plates like little forests, as we see in the picture on the left. These plates, hinged together in an endless chain, carry the matches first to a chemical bath which treats the wood so as to prevent after-glow when the match is burned. Then they are dried and carried on through another bath of paraffin, to make them catch fire readily. The boy in the little sketch at the left, who so patiently chopped splints by hand only a few decades ago, never heard of either of these devices for making a well-behaved match. In the long rows of big "gipsy-kettles" in the center picture are cooking the preparations used in tipping the match. Nearly a hundred ingredients go into this "brew," the materials being ground in big mills under expert supervision. This part of the process of making matches is the most complex, and requires several hours to complete. It is no simple, soup-stirring trick, as it was in the old days when the boy in the sketch worked at the dangerous job. The fumes from his kettle were a serious menace to his health, for he might contract "phossy jaw," a horrible disease which modern methods and scientific research have entirely eliminated.

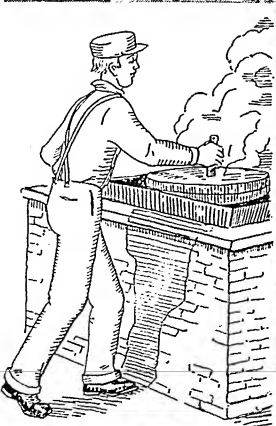


Cutting Splints

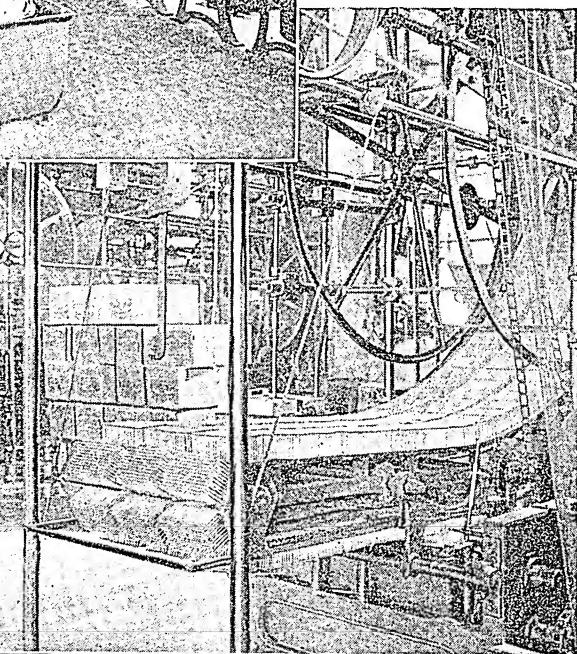


Boiling

At the lower right is the part of the machine which actually puts the tips on the matches, still without the aid of a human hand to guide that delicate operation which makes the modern completely uniform match heads. First comes the bulb dip, which puts on the larger part of the match-head. This bulb is inert to ordinary friction, and protects the tip of the match, which is put on at a second dip. This tip is the part which lights when you strike a match. The lower sketch shows the old way of dipping matches, after they had been rolled up into big "cart-wheels." Someone always had to stand by with a wet whisk broom to put out chance sparks during the boiling and dipping processes.

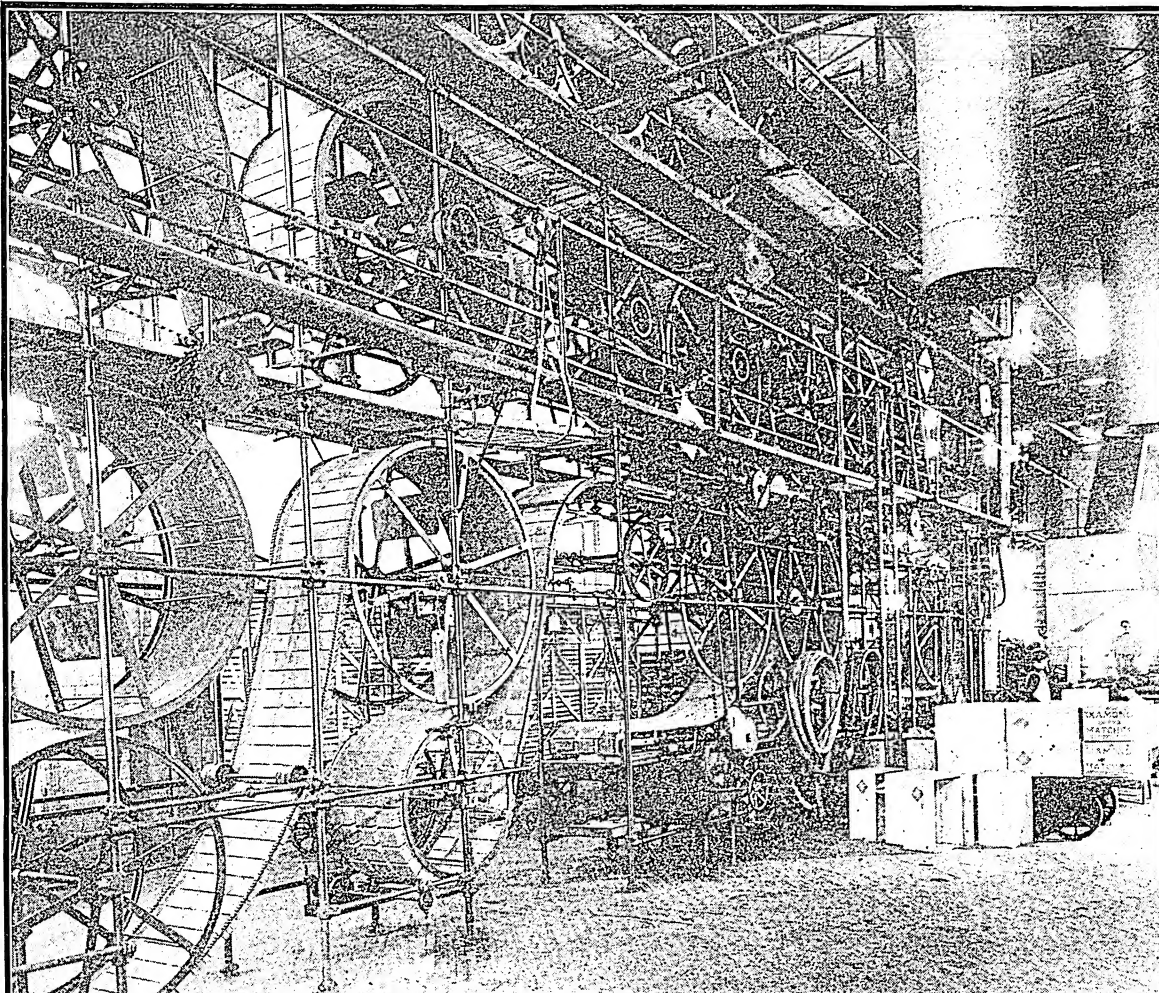


Dipping

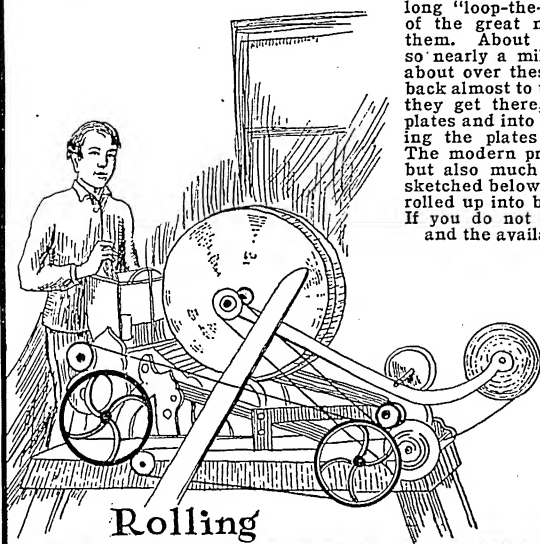




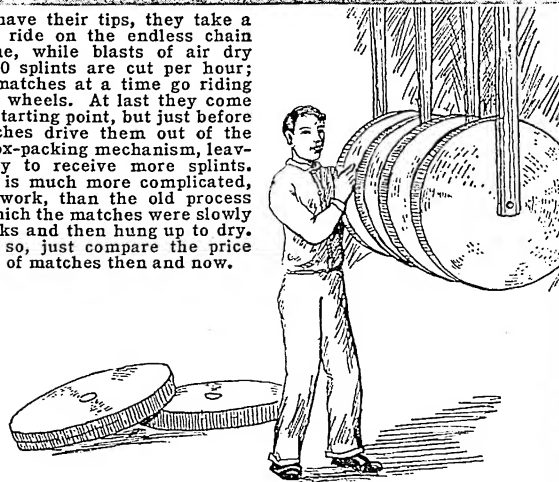
## A MILLION MATCHES ON A LOOP-THE-LOOP



When the matches have their tips, they take a long "loop-the-loop" ride on the endless chain of the great machine, while blasts of air dry them. About 900,000 splints are cut per hour; so nearly a million matches at a time go riding about over these big wheels. At last they come back almost to their starting point, but just before they get there, punches drive them out of the plates and into the box-packing mechanism, leaving the plates empty to receive more splints. The modern process is much more complicated, but also much less work, than the old process sketched below, in which the matches were slowly rolled up into big disks and then hung up to dry. If you do not think so, just compare the price and the availability of matches then and now.



Rolling



Drying

are much used, which consist of thin wax-covered wicks instead of wooden splints. Waxed cardboard is used for "sticks" in many varieties of pocket matches in America.

The making of matches is a fascinating process. All the work is done in amazing continuous match machines without the aid of the human hand. Seasoned blocks of white pine of match-length thickness are fed into these machines and turned into matches at the rate of nearly a million an hour. Even faster machines have come into use in recent years.

As the blocks are fed in, rows of hollow dies gouge into them and stamp out the round match splints. Some machines cut 50 splints at every revolution and revolve 300 times a minute, making 15,000 splints a minute or 900,000 an hour. On the upward stroke of the dies the little sticks are forced into holes in drilled metal plates, which hold them tightly. Look at a match and you will see the mark of the plate on the lower end. These plates are hinged together to form a long endless chain, which carries the splints along from one process to another.

First the sticks go into a chemical bath which prevents after-glow when the match is burned. Then they are dried and carried through a vat of melted paraffin, which makes them burn readily. Now they are ready for the head, which consists of two "dips," the first or bulb dip containing chemicals that will not ignite under ordinary friction, and the second forming the sensitive tip. After being dried by blasts of air the finished matches are pushed out of the plates and packed in boxes by automatic machinery. Each box is packed as tightly as possible, and the matches are arranged in two layers with heads in opposite directions. The result of this method of packing is that, if a case of matches gets a very hard drop, usually only half the matches in one box will light and the fire will die out when the supply of oxygen has been exhausted.

The world uses four trillion or more matches a year, or about 2,000 a year for every one of its inhabitants, according to some estimates. The United States, one of the world's chief producers, sometimes uses more than 400 billions a year. Sweden, Soviet Russia, and Japan are usually the leading foreign producers.

**MATHEMATICS.** One of the most important facts about the material world is that the objects in it can be counted and the masses can be measured. As soon as men began to count, even on their fingers, mathematics, the first of the sciences to reach formal development, began.

Pure mathematics—the science of number and quantity unconnected with any material object—includes arithmetic, algebra, geometry, trigonometry (these four constitute elementary mathematics), analytic and differential geometry, the theory of numbers, the theory of probabilities, differential equations, differential and integral calculus, infinite series, analysis of complex quantities, etc. (these belong to higher mathematics).

It was the Greeks who first lifted mathematics into the field of abstract thinking. In its higher forms mathematics becomes a form of logic, a method of reasoning, in which the scholar follows through to their result any assumptions that he lays down as basic. In this as in every form mathematics is a test and training in clear logical accurate thinking.

Because number and quantity seemed so tremendously significant, some of the ancients believed that number was the stuff from which the universe was made, or at least the key to its meaning—which seems almost like a fantastic foreshadowing of what modern physical science has discovered—that every invariable numerical relation between physical substances, every physical phenomenon which can be expressed in a finite number, is a clue to facts of the greatest value and meaning. Thus, when Galileo found that the velocity of falling bodies increases in a definite ratio with each stage of their fall, a step was taken toward the discovery of the law of gravitation; and when Dalton found that chemical combinations occurred only in definite ratios between chemical substances, the atomic theory of matter and modern chemistry were born.

Mathematics in the service of the material sciences—as mechanics, electricity, optics, geodesy, and astronomy—is known as applied mathematics. The long and involved calculations necessary in such work have been greatly facilitated by the use of tables of logarithms (invented by the Scotchman John Napier in 1614), which enable the computer to substitute addition and subtraction for multiplication and division. Mathematics is of such fundamental importance in engineering and in almost all physical sciences that it is a necessary preparation for a career in these fields. (*See Algebra; Arithmetic; Geometry.*)

**MAURITIUS.** A little oval emerald, fringed with coral and set in the sea—such is the tropical British island colony of Mauritius, in the Indian Ocean about 500 miles east of Madagascar. Its picturesque beauty, with mountains more than 2,700 feet high, is well known from the description given in Bernardin de Saint Pierre's classic, 'Paul and Virginia'.

Much of the island is still green with bamboo thickets and forests of coconut palm and other tropical trees, despite the areas that have been stripped to make way for the numerous sugar plantations. Sugar is the chief export, and to it the island owes its prosperity. Tropical fruits, coffee, cocoa, corn, rice, spices, vanilla beans, hemp, and yams are also grown, for agriculture engages a majority of the inhabitants. It is one of the most densely populated regions in the world, owing to the Hindu coolies imported to work in the sugar fields. In addition there are Chinese, Malays, negroes, and about 4,000 whites—most of the latter descendants of early French colonists.

Mauritius was discovered about 1505 by the Portuguese, who soon abandoned it. It was occupied in 1598 by the Dutch, who gave it its present name after

their Count Maurice of Nassau. The French were its next masters after the Dutch abandoned it in 1710, and they called it "Île de France." The English occupied it in 1810.

Mauritius was once the home of the dodo—a pigeon as large as a turkey—and of a large land tortoise and a crested parrot. They are now extinct (*see* Dodo). Terrific hurricanes often sweep over the island. The capital is Port Louis (55,000). Area, about 720 square miles; population, about 425,000.

**MAY.** The first of May, the fifth month of our year, has always been a gala day. The May Day festival goes back to the Roman festival to Flora, the goddess of flowers, which probably came in the first place from India. In England, as we learn from Chaucer and Shakespeare, it was customary during the Middle Ages for all, both high and low—even the court itself—to go out "a-maying" on the first of this month at an early hour, "to fetch the flowers fresh." The fairest maid of the village was crowned with flowers as Queen of the May. Every town and village had its Maypole on the village green, on which wreaths of flowers were hung and round which the people danced. The Puritans strongly denounced Maypoles and May

dances, and they were forbidden by Parliament in 1644, but they once more came into favor with the Restoration under Charles II.

**MAY-APPLE.** When you go into the woods in early spring you find here and there little green fairy umbrellas, holding one or two large fragrant white flowers between their two shield-shaped leaves. If you visit the woods a little later you will see why these plants are called "may-apples," for under the umbrellas—which now have stems from 12 to 15 inches long—are some tiny yellow apples about the size of a large cherry, egg-shaped fruits having a rather unpleasant insipid taste which, as one writer tells us, are "relished by pigs and boys." In another way these may-apples are useful as well as beautiful, for their leaves and creeping rootstocks are used medicinally.

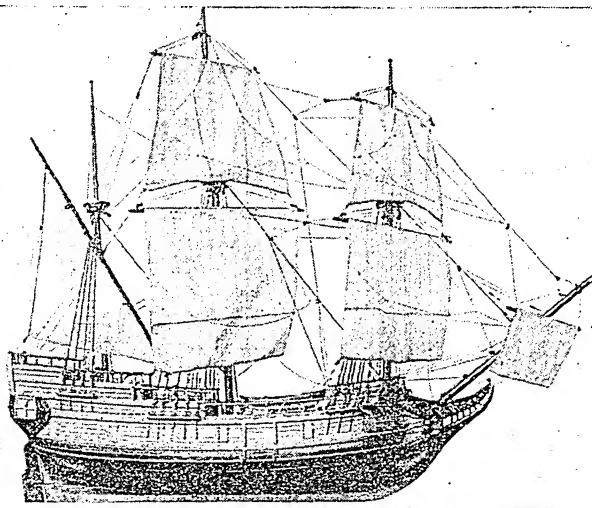
The scientific name for this perennial herb is *Podophyllum peltatum* and it belongs to the barberry family (*Berberidaceae*). The smooth leaves are 9 to 12 inches wide, the fruit is one-celled and many-seeded. In the United States it is often called "mandrake," but the true mandrake is a totally different plant (scientific name *mandragora*), native to the south of Europe and oriental countries. Many superstitions gathered about the mandrake, such as the belief that it would shriek when uprooted. It is supposed to be poisonous, though the root was formerly used in medicine.

## The PILGRIM QUEST for RELIGIOUS FREEDOM

*What the Sailing of the Mayflower Meant to the Future of Mankind—The Compact that Established and Set an Example for All the World of a Government Of the People, By the People, and For the People*

'**MAYFLOWER**'. In the last three centuries thousands of ships have made their way to America, bearing from the Old World the men and women who have helped to make up the population of the American nation. Compared to most of these vessels, the *Mayflower*, a little sailing vessel of 180 tons, was but a cockle-shell. Yet no other ship's arrival was fraught with such significance as that of this little vessel, which brought the Pilgrim Fathers to America in the year 1620.

To understand who these Pilgrims were and why they came here, we must go back to the north of England and to about the year 1600. Then it was that a group of earnest men and women began to gather together in secret for religious devotion at the home of William Brewster, which was the old manor house of the little village



This model is an exact representation of the historic 'Mayflower', and gives you a good idea of the small craft in which the company of Pilgrims, 102 in number, braved the Atlantic and came to America. For 65 days this little cockle-shell was tossed about in Atlantic storms. The model is in the United States National Museum in Washington.

of Scrooby in Nottinghamshire. Like so many Puritans of that time they objected to the half-way religious settlement of Elizabeth. People like this little congregation were called Separatists, since they wished to have a separate church instead of conforming to an established Church of England. (*See* Puritans.) In thus following the dictates of their conscience, they defied the laws of the realm, and for this they suffered heavy penalties. As William Bradford, himself one of their number, wrote later,

"Some were taken and clapt up in prison, others had their houses besett and watcht night and day, and the most were faine to flie and leave their houses and habitations and the means of their livelihood."

Because of these persecutions they were driven at last to leave England. There was one country where



they knew they would be allowed to worship as they chose—that was Holland; and to Holland they managed, after some difficulties, to escape in 1608. From Amsterdam, where they landed, they went to Leyden, and there established a settlement and a church under the leadership of their beloved minister, John Robinson.

But though they found freedom in Holland, it was not and could not be really home to them. Life there was very hard. Most of them had been farmers, and they were now forced, in this industrial and commercial community, to follow occupations to which they were unaccustomed, and by which they could earn only a bare subsistence. Worse still, their children were in danger of falling away from their faith, and they were growing up Dutchmen instead of Englishmen. So after long discussions it was decided to go out into the wilds of the New World, where they might preserve their native language and customs and have freedom to worship as seemed right to them.

After the necessary permission to settle had been obtained and all preparations made, on a bright July day in 1620 they set sail in a little ship called the *Speedwell*. At Southampton, in England, they found another ship awaiting them, the *Mayflower*, with a number of Separatists from London, who wished to join the expedition. But the vessels had proceeded only a short distance when the *Speedwell* began to leak. Twice they turned back. Finally, abandoning the *Speedwell*, the *Mayflower* sailed from Plymouth on September 16, under Capt. Christopher Jones.

It is hard to realize today the hardships and perils of that voyage. The delays had brought them to the time of the equinoctial storms. The *Mayflower* was considered a sturdy ship for her day, but little advance had been made in ship-building since the time of Columbus. For two months and five days the weary voyage continued. Living in the stifling air of their close quarters, amid the tossing ocean, many of the Pilgrims fell sick. One man, William Batten, died; and a baby, named Oceanus Hopkins, was born.

At last, on November 19, they sighted the bleak and desolate shores of Cape Cod, and on November 21 they were safely anchored in the sheltered harbor just within the tip of the cape, where Provincetown now stands. But their troubles were far from being over.

"Being thus passed the vast ocean, and a sea of troubles," writes Bradford, in the quaint language of that time, "they had now no friends to wellcome them, nor inns to entertaine or refresh their weather-beaten bodys, no houses or much less townes to repaire too, to seeke for succoure. And for the season it was winter, and they that know the winters of that countrie know them to be sharp & violent, & subjecte to cruell & fierce stormes, deangerous to travill to known places, much more to serch an unknown coast. Beside, what could they see but a hidious and desolate wilderness, full of wild beasts and wild men? and what multitudes ther might be of them they knew not."

Their grant from the Virginia Company of Plymouth was to settle in "Virginia," but they had come to

land north of that province. They wished to sail south to the Hudson; but the master of the ship refused and declared they must seek out a place of settlement where they were. In a little boat called a "shallop" they explored the wintry waters of the bay. Such a site as they sought was found at Plymouth, across the bay. To that harbor the *Mayflower* was then moved, to begin the settlement that meant so much for America.

Before leaving the ship as "loyall subjects of our dread soveraigne Lord, King James," the heads of the Pilgrim band set their hands to the famous "Mayflower compact." In this they promised to "combine ourselves together into a civill body politick, for our better ordering and preservation and furtherance of the ends aforesaid; and by vertue hereof to enacte, constitute, and frame such just and equall lawes, ordinance, acts, constitutions, and offices, from time to time, as shall be thought most meete and convenient for the generall good of the Colonie, unto which we promise all due submission and obedience." This is said to be the first written agreement ever made providing for the government of the people and by the people, and so it is a priceless heritage. (See also Plymouth, Mass.)

#### The List of the Mayflower Pilgrims

A General Society of Mayflower Descendants was formed in 1879, with branches in many states of the Union. William Bradford, himself one of the immortal Pilgrim band, gives us in his 'History of Plymouth Plantation' the following list of Mayflower passengers, 103 in all.

The names of those which came over first, in the year 1620, and were by the blessing of God the first beginners and (in a sort) the foundation of all the Plantations and Colonies in New-England; and their families.

Mr. John Carver; Kathrine, his wife; Desire Minter; and 2. man-servants, John Howland, Roger Wilder; William Latham, a boy; and a maid servant, and a child that was put to him, called Jasper More.

Mr. William Brewster; Mary, his wife; with 2. sons, whose names were Love and Wrasling; and a boy was put to him called Richard More; and another of his brothers. The rest of his children were left behind, and came over afterwards.

Mr. Edward Winslow; Elizabeth, his wife; and 2. men servants, caled Georg Sawle and Elias Story; also a little girl was put to him, caled Ellen, the sister of Richard More.

William Bradford, and Dorothy, his wife; having but one child, a sone, left behind, who came afterward.

Mr. Isaack Allerton, and Mary, his wife; with 3. children, Bartholmew, Remember, and Mary; and a servant boy, John Hooke.

Mr. Samuell Fuller, and a servant, caled William Batten. His wife was behind, and a child, which came afterwards.

John Crakston, and his sone, John Crakston.

Captin Myles Standish, and Rose, his wife.

Mr. Christopher Martin, and his wife, and 2. servants, Salamon Prower and John Langemore.

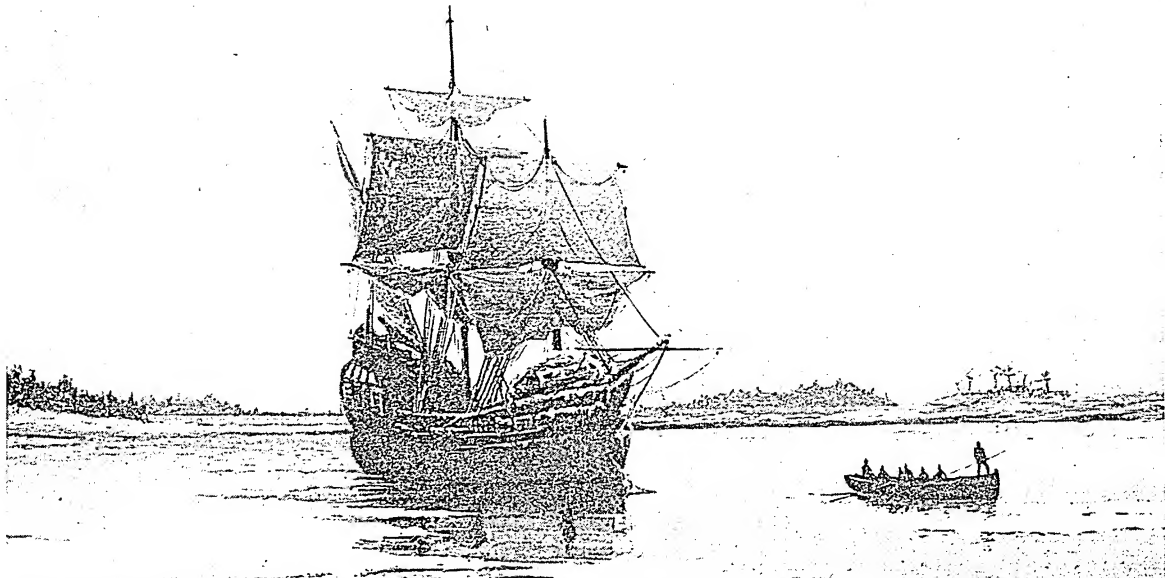
Mr. William Mullines, and his wife, and 2. children, Joseph and Priscila; and a servant, Robart Carter.

Mr. William White, and Susana, his wife, and one sone, caled Resolved, and one borne a ship-bord, caled Peregrine; and 2. servants, named William Holbeck and Edward Thomson.

Mr. Steven Hopkins, and Elizabeth, his wife, and 2. children, caled Giles, and Constanta, a daughter, both by



## A TINY SHIP THAT MADE MOMENTOUS HISTORY



This picture by William F. Halsall shows the *Mayflower* lying at anchor in Plymouth harbor, while a party of Pilgrims is rowing ashore to explore the land and prepare shelters for the settlement. During the winter the colonists lived on shipboard, until they had built cabins for all.



The signing of the famous "Mayflower Compact," one of the memorable events in the history of America, took place in the tiny cabin of the vessel on Nov. 21, the day it reached Provincetown harbor. Here one of the Pilgrims is putting his name to the historic document by which the colonists bound themselves to stand together and obey such laws as they might make for their general welfare.

a former wife; and 2. more by this wife, caled Damaris and Oceanus; the last was borne at sea; and 2. servants, caled Edward Doty and Edward Litster.

Mr. Richard Warren; but his wife and children were lefte behind, and came afterwards.

John Billinton, and Elen, his wife; and 2. sones, John and Francis.

Edward Tillie, and Ann, his wife; and 2. children that were their cossens, Henery Samson and Humillity Coper;

John Tillie, and his wife; and Eelizabeth, their daughter.

Francis Cooke, and his sone John. But his wife and other children came afterwards.

Thomas Rogers, and Joseph, his sone. His other children came afterwards.

Thomas Tinker, and his wife, and a sone.

John Rigdale, and Alice, his wife.

James Chilton, and his wife, and Mary, their dougter. They had an other daughter, that was married, came after-ward.

Edward Fuller, and his wife, and Samuell, their sonne.

John Turner, and 2. sones. He had a daughter came some years after to Salem, wher she is now living.

Francis Eaton, and Sarah, his wife, and Samuell, their sone, a young child.

Moyeses Fletcher, John Goodman, Thomas Williams, Digerie Preist, Edmond Margeson, Peter Browne, Richard Britterige, Richard Clarke, Richard Gardenar, Gilbert Winslow.

John Alden was hired for a cooper, at South-Hampton, wher the ship victuled; and being a hopfull yong man, was much desired, but left to his owne liking to go or stay, when he came here; but he stayed, and married here.

John Allerton and Thomas Enlish were both hired, the later to goe mr of a shalop here, and the other was reputed as one of the company, but was to go back (being a seaman) for the help of others behind. But they both dyed here, before the shipe returned.

There were also other 2. seamen hired to stay a year here in the country, William Trevore, and one Ely. But when their time was out, they both returned.

These, being aboute a hundred sows came over in this first ship; and began this worke, which God of his goodnes hath hithertoo blessed; let his holy name have the praise.

**MAY-FLY.** Those delicate-winged insects, with long threadlike tails, which in many places suddenly appear in clouds in late spring and early summer, filling up the globes of arc-lights, settling in helpless masses on windows and sidewalks, or covering the surfaces of ponds and lakes with their bodies, are called "May-flies," "shad-flies," or "day-flies." This last name comes from the extraordinarily short life of the adult insect, which was formerly believed to last but a day, and which, in fact, is rarely longer than a week. The adult May-fly is incapable of taking any food, either solid or liquid, hence its brief life.

But if the final stage of its life is short, the early stages are long. Among the 300 or more species of May-flies are some that spend three years in the larval stage after hatching from the eggs.

The eggs are laid in large numbers in the water and sink to the bottom. The larvae are strong and active creatures which spend their time swimming about, crawling on the bottom, or burrowing in the ooze in search of the smaller forms of animal and vegetable life on which they feed. When full grown, they rise to the surface, burst their skins, and fly away in huge swarms. Lighthouse keepers on the Great Lakes often have difficulty in keeping their lights clear of

these swarms. Fish devour May-flies greedily, and many of the artificial flies used by anglers are imitations of these insects.

May-flies belong to a very ancient and primitive type of insect, fossils of their ancestors having been found in the deposits of the Coal Age. They are interesting to scientists chiefly because they pass through what is called a *sub-imago* stage—that is, after the winged adults emerge from the water they shed their skin again, the full *imago* often coming forth in colors very different from those of the *sub-imago*. This is a habit found in no other insects.

**MAZZINI** (*mät-sē'nē*), GIUSEPPE (1805–1872). Italy was "a mere geographical expression," made up as it was of many small states, when Mazzini, the "Prophet of Italian Unity," lent his aid to the age-long task of rendering it a united nation.

In 1821 the sight of the refugees from the unsuccessful rising in Piedmont led him to give up his promising career as a lawyer and journalist of Genoa, and devote his life to the work for unity and liberal republican ideas. As one of the "Carbonari" (revolutionaries) he was imprisoned in 1830. When set free the next year, his life-plan was settled. His first step was the formation of a revolutionary society called "Young Italy," whose motto was "God and the People" and whose banner bore on one side the inscription, "Unity and Independence," and on the other, "Liberty, Equality, and Humanity."

Mazzini's revolutionary activity made Italy exceedingly dangerous for him, and from 1832 he led the life of an exile. He was the most untiring political agitator in Europe, the man most dreaded by its absolute governments. He was always writing, and his organization soon extended through Italy. For seven years he struggled hard against poverty in England, yet managed to help his poorer ignorant countrymen, the London hand-organ grinders, by teaching them in night classes.

On the outbreak of the Lombard revolt (1848) Mazzini threw himself into the struggle. When the republic was proclaimed at Rome, Mazzini was chosen one of three triumvirs with the power of dictators. On April 26, 1849, however, the French soldiers arrived, and in June the republic fell, and with it the immediate plans for Italian unity.

Ardent patriotism, heroic self-sacrifice, and unconquerable faith in the final triumph of his ideas made Mazzini a great leader of men. His influence was strongest with his own class—the lawyers, doctors, professors, and army officers. He could not work well with others, for he could never compromise. This fault led to difficulties between him and the other two leaders of Italian unity—Garibaldi, its knight-errant, and Cavour, the statesman who conceived the plans which finally made union a reality.

Mazzini was sentenced to death three times. In 1866, after the kingdom of Italy was established, the sentence was formally rescinded, and he died peacefully at Pisa, March 10, 1872.

**MEADE, GEN. GEORGE GORDON (1815-1872).** To General Meade belongs the honor of having commanded the United States troops in the greatest battle ever fought on American soil, that of Gettysburg. Just three days before the battle began he received his appointment as head of the Army of the Potomac. This was a most important command, but he was a man of experience and thoroughly trained in war. He had been graduated from West Point, in 1835, had served with honor in the Mexican War, and had already won distinction in the battles of Antietam and Fredericksburg in 1862.

It was a critical situation which General Meade was called upon to face when he took command at the end of June 1863. A Confederate army under General Lee was on Northern soil, and the people of the North were panic stricken. When handed his appointment as commander, General Meade—so intense was the criticism directed against all officers of the Army of the Potomac—at first mistook it for an order for his arrest. As commander in the battle of Gettysburg (July 1 to 3, 1863) he more than justified all expectations formed of him. Lee was forced to withdraw from the field, and Meade was left victor in what proved to be the decisive battle of the war. But

he failed to follow up his victory and crush the army which he had conquered. This failure led to such bitter criticism of him at the North, even by President Lincoln, that Meade asked to be relieved of his command. His request made the public realize that, while he had not done all that they wished, he had performed a great service in driving back the Confederate army from Northern soil. For this service, three years later, he received a vote of thanks from Congress, and from his fellow-citizens a residence in Philadelphia in which he spent his last days.

Meade was made major-general in the regular army in 1864, and retained the command of the Army of the Potomac, under General Grant, during the battles of the Wilderness, the siege of Petersburg, and other conflicts, until the close of the war. He was in command of the division of the Atlantic, 1865-66; of the department of the east, 1866-67; and later of the military district which included Georgia, Alabama, and Florida. His headquarters after the

war ended were at Philadelphia, where he died, Nov. 6, 1872. (See Gettysburg, Battle of.)

**MEADOWLARK.** "Spring o' the y-e-a-r-r! Spring o' the y-e-a-r-r!" Above the frosty brown meadow the chime-like whistle rings again and again. Although the happy singer on his fence post is the only visible sign that winter is over, we look at once for greening fields and waking brooklets, because for springs un-

counted our meadowlark prophet has never failed.

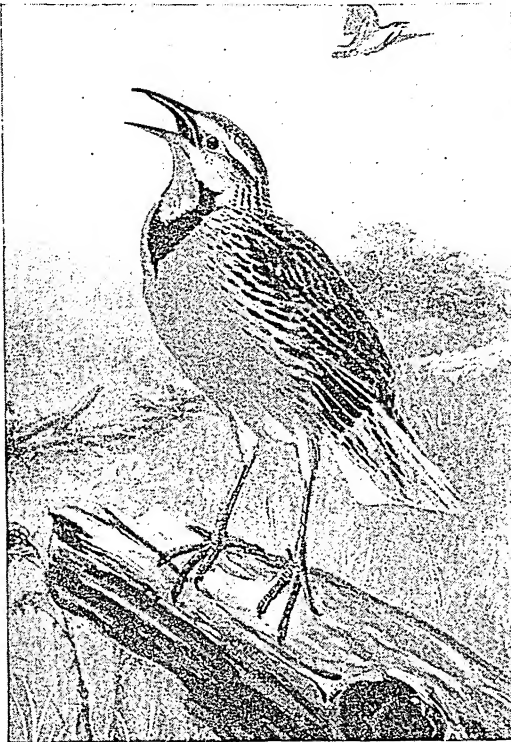
He is distinctly an American bird. Although a close relative of the blackbird, and not a lark at all, he has a larklike fashion of nesting on the ground and of singing on the wing above his meadow home.

The meadowlark is about 10½ inches long. His feathers are brown streaked with black, his breast is a bright black-spotted yellow, adorned with a striking crescent of glossy black feathers just below the throat (for illustration in colors see Birds). The nest, with its three to seven white brown-spotted eggs, is so cleverly hidden in the grass that you are only saved from stepping on it by the sudden appearance of the mother bird who flies up from almost under your feet. She is a bit smaller than her mate and her plumage is a shade paler.

Besides its beauty and its happy song-call, the meadowlark has another claim to our affection. More than half of its food is harmful insects, and of the other half the greater part is weed seeds, supplemented with grass seed and some waste grain. In spite of its harmless habits the meadowlark was for many years shot as a game bird, but now is protected by law in almost every state.

Meadowlarks breed throughout the United States and in Canada. They migrate from the north as cold weather approaches, though they frequently winter in New England. The western part of America has a slightly different species called the western meadowlark. Its habits and appearance are almost the same as those of the eastern meadowlark, but it is a bit smaller and grayer, and the breast yellow is somewhat deeper. Its song is far more beautiful than that of its eastern relative, and this is one of the distinguishing characteristics which has led scientists to consider it a separate species. Scientific name of meadowlark, *Sturnella magna*.

#### THE HARBINGER OF SPRING



Together with the robin, the Meadowlark is a welcome visitor because when we hear his song in the fields we know that spring is at hand.



## "PACKING-TOWN" and Its Myriad Products

**M**EAT PACKING. This is a distinctly American industry with Chicago as its chief center. Within recent years the business has grown to proportions which have astonished the world and changed the lives and habits of people in many civilized countries. It covers the whole process of buying, slaughtering, curing, preserving, manufacturing, and selling meats and their by-products. From the packers come most of our fresh meats and poultry, our hams and bacon, lard and lard substitutes, pickled pork and corned beef. They have also supplied our markets with eggs, cheese, butter, and oleomargarine; engaged in the manufacture or marketing of canned meats, soaps, washing powders, and many other canned products, hides, fertilizers, etc. Their buyers are stationed at all of the leading live stock markets gathering up supplies from farm and factory; their salesmen and refrigerator cars carry their products to practically every meat and provision dealer.

People who visit the Chicago stockyards, commonly called "Packing-town," usually expect to find one set of buildings and many stock pens. They see cattle, sheep, and hog pens in abundance, but they are astonished to find that the "yards" is a manufacturing city in itself, with many buildings and streets, banks and stores, telephone and telegraph exchanges.

*SOMEONE has said that in the great packing houses of today "every part of the hog is made use of except the squeal!" The astonishing degree to which economies, efficiency, and organization have been carried lend some justification to this humorous remark, as the accompanying article shows.*

Elevated railways run overhead and elevated sidewalks, pens, and buildings are everywhere. Some idea of the size of this packing center may

be obtained from the fact that the Chicago yards comprise 500 acres, and include 300 miles of railway track, 25 miles of streets, and 13,000 pens. They are able to handle a daily peak of 75,000 cattle, 100,000 sheep, or 200,000 hogs. On a busy day you might be able to count 3,000 or more railway cars bringing in animals. You would see hundreds of salesmen, buyers, and employees hurrying about on horseback, in motor cars, and on foot, and thousands of laborers employed in the packing plants.

The Chicago yards handle about one-sixth of all the live stock marketed through American stockyards. This live stock is paid for in cash every day. In an average year the Chicago yards receive about 14 million head of live stock though the figure varies considerably from year to year. Of this 14 million, about 2,260,000 are cattle, 540,000 are calves, 7,340,000 are hogs, and 3,860,000 are sheep. The yards also receive and ship horses. About one-third of the cattle are sold as feeders, to be fattened further on farms. To handle this year's business requires more than 235,000 stock cars, which make up some 5,800 stock trains, with scores of thousands of refrigerator cars to distribute the products over the country.

### PANORAMIC VIEW OF THE GREAT UNION



This picture shows the north portion of the huge stock yards maintained in Chicago by a union company to serve the live stock and meat-packing industry. In facilities and arrangement, the yard is a marvel of efficiency. During the early morning, stock trains from the Middle West pour in over the tracks seen in the upper left-hand corner, and the animals are distributed to pens.



The United States is at once the greatest meat-producing and meat-eating country in the world. It not only supplies its own needs, but furnishes a great deal of the meat consumed in other countries as well.

Much of this meat is cured or canned, but a great deal is shipped fresh in refrigerator cars. Many labor-saving devices are employed by the packing companies. Animals are slaughtered and dressed and the meats taken to the refrigerating rooms in surprisingly short times. A hog is shackled to either an inclined elevator device or a revolving wheel, killed, scalded, disemboweled, and dressed, all in a few minutes. Cattle are driven into a row of pens, killed, and hoisted by chains that move along an overhead track past a row of workmen. Each workman performs one special task as a carcass passes him. The greatest care is taken to keep the meat clean and sanitary, and to cut the carcasses so that nothing shall be wasted. The average yield of meat ranges from 50 to 55 per cent of the live weight of cattle, from 45 to 50 per cent for sheep, and from 70 to 75 per cent for hogs.

#### How the By-Products Are Used

Most noteworthy of the economies produced by modern packing methods, however, is the production of an astonishing array of by-products from parts of animals formerly thrown away as waste. Hides and skins, of course, have always been made into leather, but now valuable products are made from the blood, bones, hoofs, horns, and entrails.

The blood yields albumen, and serum for use in laboratories in the culture of bacteria. It is also used in the manufacture of water-proof glue and

fertilizer. Horns and hoofs, after being softened with steam and flattened, are made into knife handles, combs, buttons, hairpins, umbrella handles, napkin rings, dice, and various knick-knacks. Hog bristles are used for brushes and hog hair is used to stuff cushions and upholstery. Hair from cattle and calves is used in making rope, to stuff horse collars, and as a binder in plaster. From sheep intestines is made catgut for the strings of tennis rackets and musical instruments. Several important preparations used in medicine are derived from the brains, stomachs, and glands of slaughtered animals. These include insulin, pepsin, pancreatin, and thyroid extract. The inedible fats are extensively used in making soap, lubricating oil, and illuminating oil.

Other items on the long list of by-products (about 150 in all) are glue, gelatine, oleo oil (used in the manufacture of margarine), stearin, sausage casings, bone charcoal, tallow, lard, bone meal, hair for "camel's hair" brushes, goldbeater's skin, neatsfoot oil, cattle and poultry feed, and fertilizers.

The profits from the by-products enable the packers to sell meat for much less than they would have to charge if the meat had to bear all the expenses of production. It is this economy that has urged the centralization of the packing industry into large units. Each of the largest packing companies has done a business of more than \$900,000,000 in one year. The five largest companies, which handle about 40 per cent of the total meat production of the United States, have done a combined annual business of two and one-half billion dollars.

#### STOCK YARDS IN THE HEART OF CHICAGO



There buyers inspect them, and soon a steady stream of live stock starts along the alleys and through the overhead runways, or covered passageways, to the meat-packing establishments, which are to the left of the area shown in the picture. By night, most of the animals received have been slaughtered, and the railroads are busy hauling away meat toward the four quarters of the globe.

## THE NEW ARRIVALS AND THE BUYERS



Each commission man doing business in the stockyards has pens like this into which cattle consigned to him are unloaded. The men on horseback who are looking them over are buyers. While most of these buyers represent the large packing companies, there are also those who buy and ship to customers in other towns, such as packers in smaller centers. Other buyers are speculators, buying when they think prices are unusually low and holding for a rise. Still other buyers are what are called "feeders" — that is to say they buy cattle that are not as fat as they should be, feed them up, and resell them.

These manufacturing and selling methods not only produced profits for the packers, but helped to give us full supplies of meats at all times at fairly even prices. There is no doubt that the packers have served us by their modern and efficient methods. The meats we get are better protected against decay in the refrigerator cars and cold storage warehouses, and employment is provided for many thousands. The farmers and stockmen are also benefited, for they can sell their product any day in the year for the nation-wide market price. This "world-wide market" is perhaps the greatest advantage of all, for it sets off, for example, a shortage in Europe against a surplus in Iowa, and so keeps prices level.

The development of the great meat packing industry has been made possible by modern improvements in cold storage. At one time we thought that the best way to preserve meats was by salting, pickling, or smoking. Now we have fresh meats delivered to our tables from cold storage warehouses and refrigerator cars weeks and even months after butchering. We get just the cuts we want. If we prefer cheaper cuts, such as brisket, chuck, or round steak, the sir-

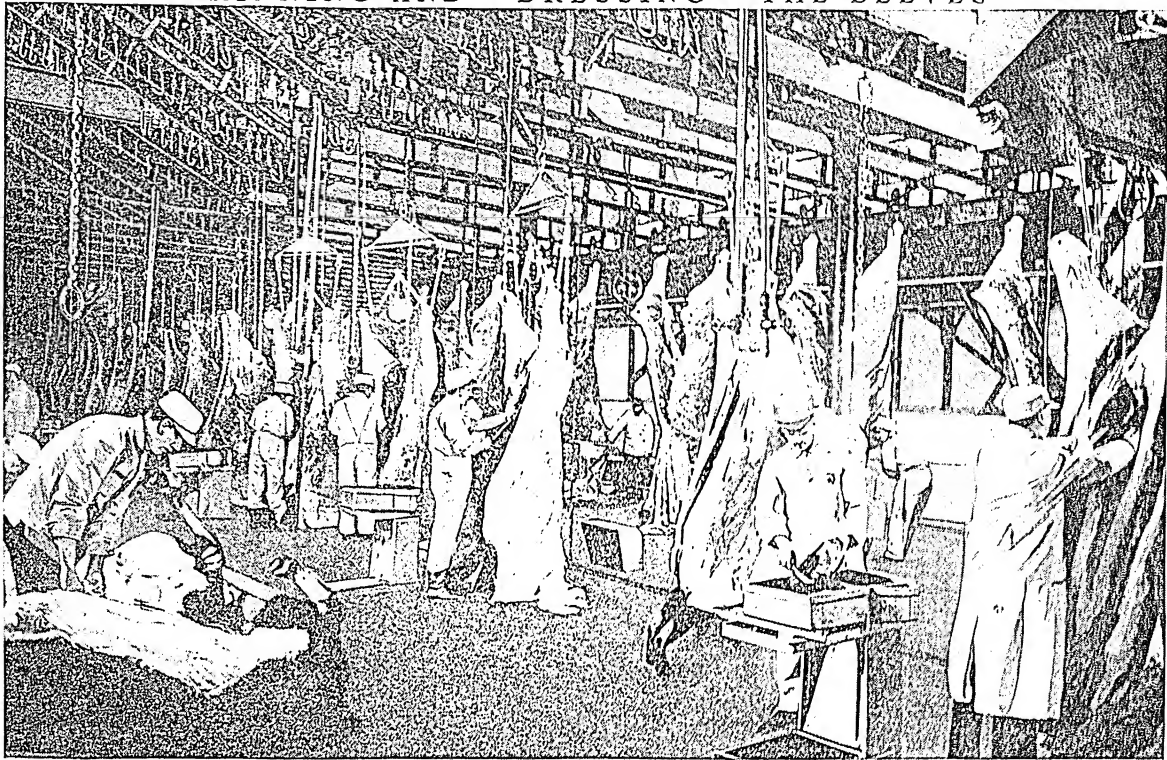
loin steak is shipped elsewhere. Most packing houses have their own cold storage warehouses and plants for making ice. (See Cold Storage; Refrigeration.)

Every care is taken by the government to see that the animals slaughtered are in a healthy condition, and that public health is protected. To this end the Federal government passed an act in 1891 requiring the stamp of its inspectors for all meats shipped in interstate commerce.

We must not suppose, however, that all the meat is handled by the big packers of Chicago, Omaha, and Kansas City. There are more than 1,200 meat packing concerns scattered over the United States. Also a great deal of beef, pork, and mutton is still slaughtered and dressed on the farms, and by local butchers in villages and small towns. Public "abattoirs" or slaughtering houses have been established in a number of cities, most of them municipally owned and operated. Coöperative packing houses have also been promoted in a number of communities. In some of the Southern states the people cure their meats at local ice houses. Surplus hogs and cattle for local consumption can be sold at these plants.

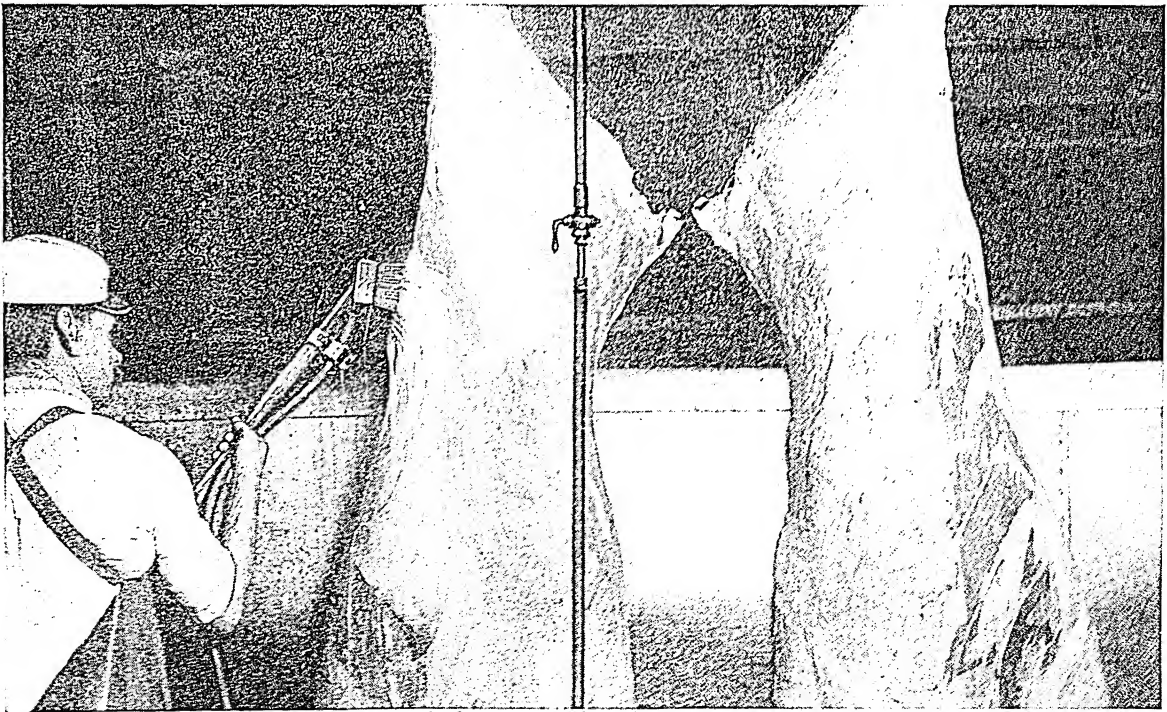


## SKINNING AND "DRESSING" THE BEEVES



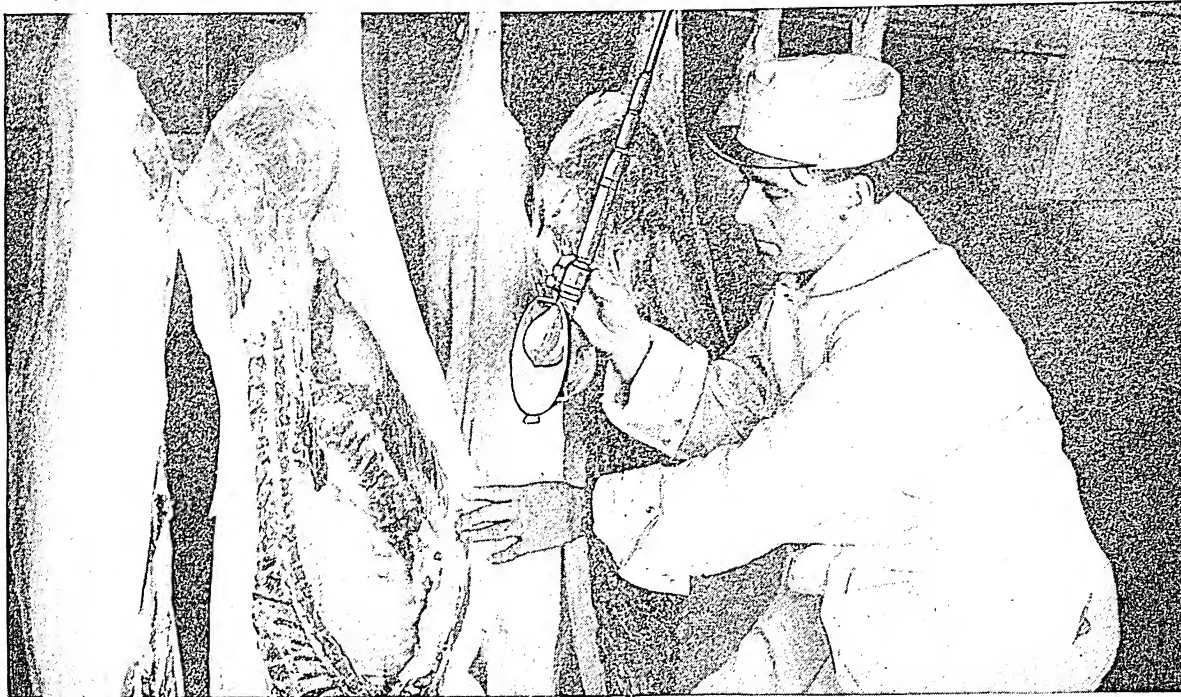
After the animals are killed, they undergo a preliminary examination by government inspectors, and are then carried into the beef dressing department. Here the hide is removed, and the carcasses are lifted from the floor to a system of overhead trolleys. They pass along these trolleys from one skilled workman to another, each of whom does some special portion of the work of dressing.

## SCRUBBING THE BEEF WITH "WATER BROOMS"



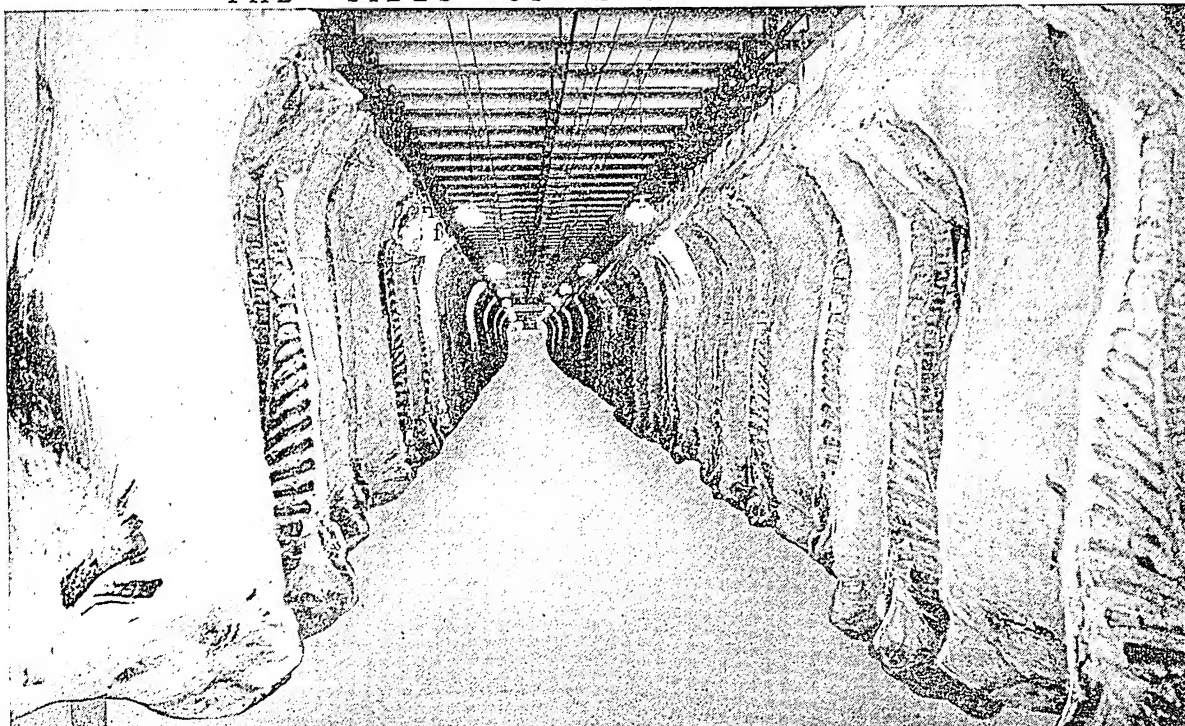
When the dressers have finished their work, the beefs pass along the trolleys to a long line of washers, armed with what are called "fountain brushes." These clean the carcasses thoroughly before sending them to the refrigerating rooms.

## FINAL EXAMINATION BY THE GOVERNMENT INSPECTOR



A government official in his clean white suit and apron is here giving the final inspection to the carcasses of hogs. Notice the electric lamp with the reflector attached to aid in the examination. All animals have four inspections. One of these takes place before it is slaughtered. After slaughtering there is a special examination of the throat glands, another of the internal organs, and then the final inspection here shown, in order to be sure that no diseased meat is sold.

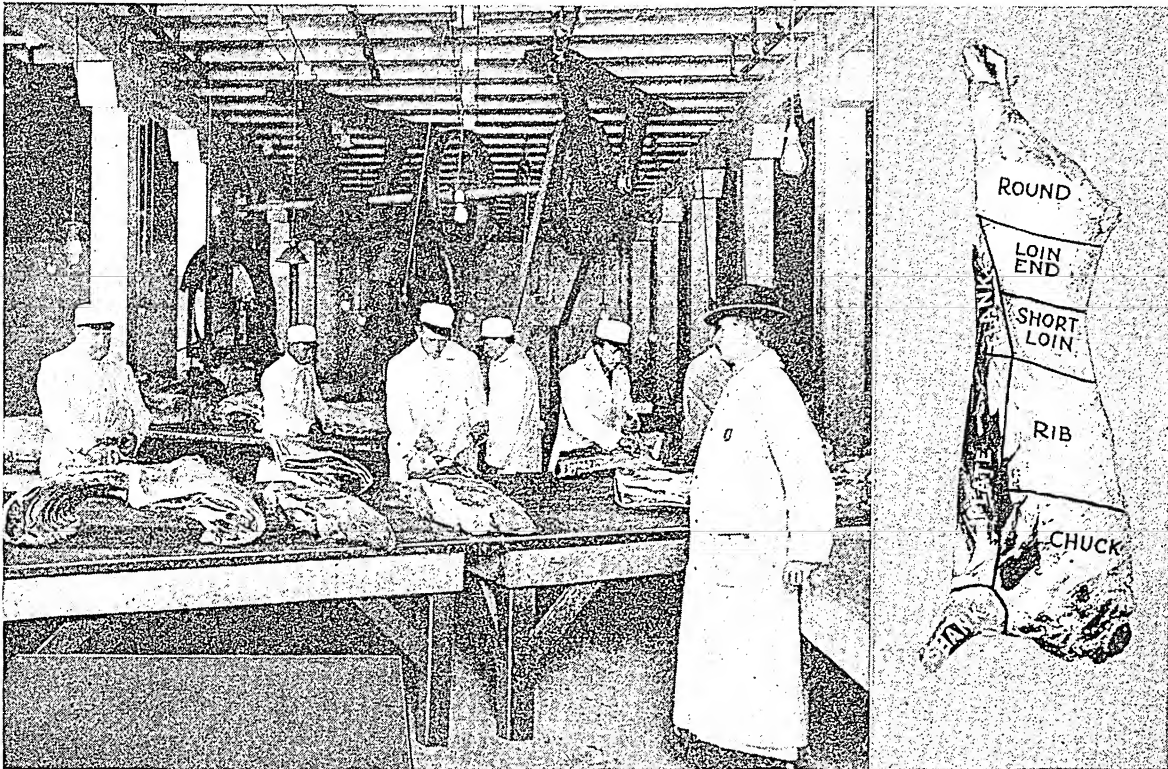
## THE "SIDES" OF BEEF IN THE COOLER



After passing the various tests, the carcasses are carried along on trolleys into coolers like this. Each cooler is a great room that is kept at a temperature about six degrees above freezing. This temperature chills, but does not freeze the meat. From these coolers it is delivered to local dealers or shipped in refrigerator cars to coolers in branch houses owned by the packing companies throughout the country.

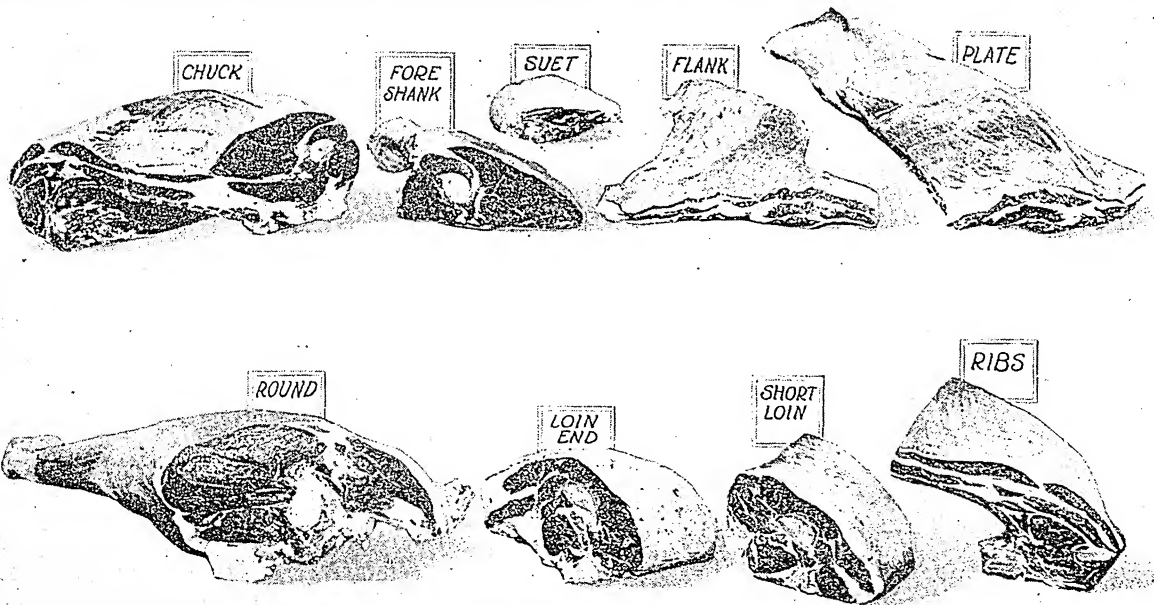


## IN THE BEEF CUTTING DEPARTMENT



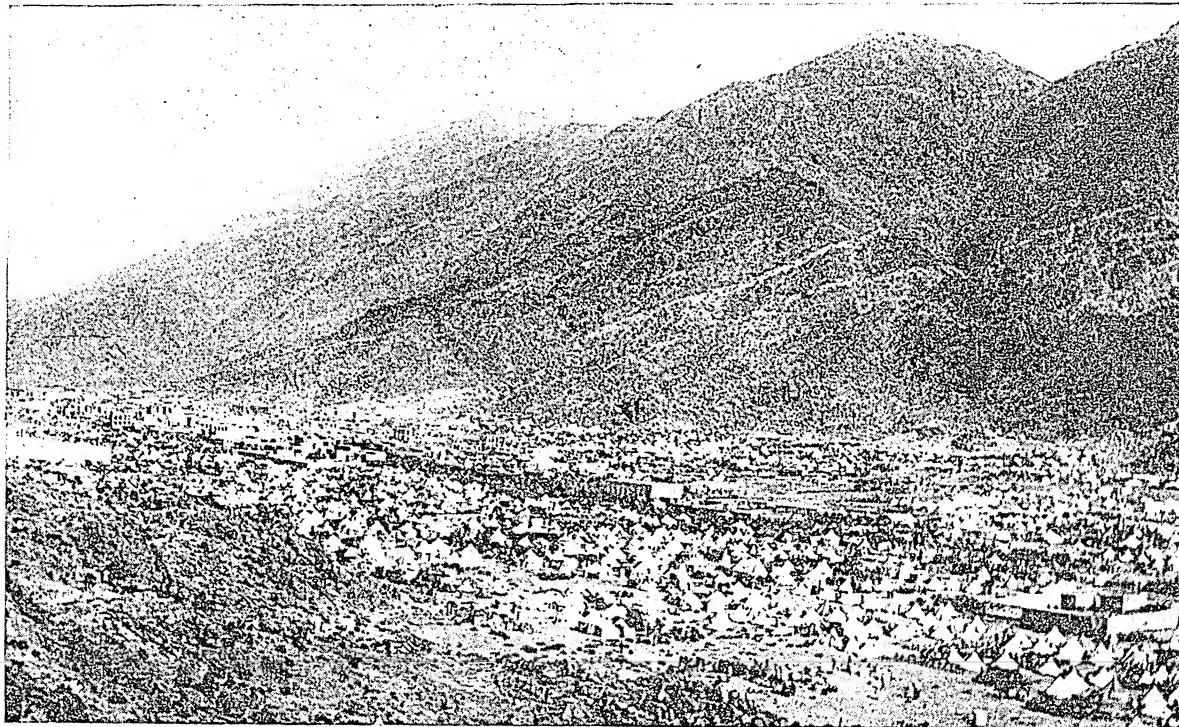
Here are the butchers in their white frocks dividing the "sides" of the beef into the various cuts required by the retail trade. This also is done under government supervision and the white frocks are a part of the regulations. Only a small percent of the sides however, are cut at the plant, the great bulk being shipped out whole to be cut by the retail butchers in accordance with the demand of their trade.

## THE VARIOUS CUTS OF BEEF

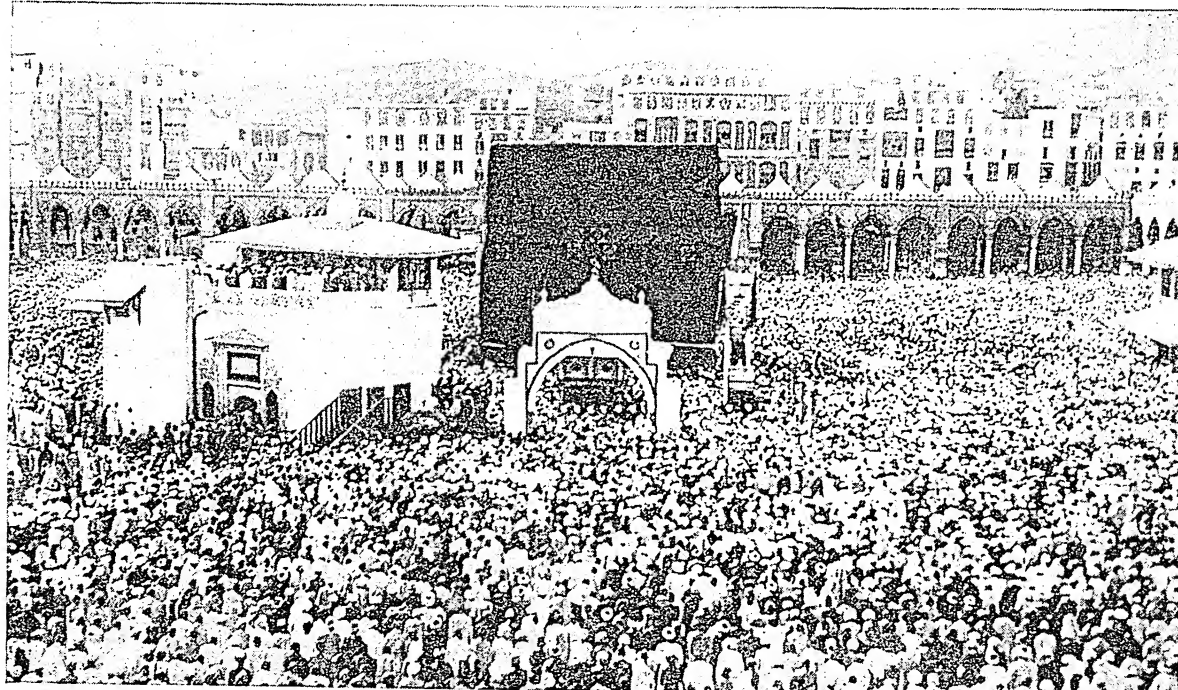


Everybody, of course, knows what part of the animal a round steak comes from, but do you know the other cuts? Here they are so that you can easily identify them in the butcher shop. On the right in the upper picture are shown the parts of the beef from which these cuts come. The end of the loin nearest the "round" gives sirloin steak, the middle portion tenderloin steak, and the rib end porterhouse. The real "tenderloin"—not the steak—grows inside the loin.

## WHEN THE PILGRIMS COME TO HOLY MECCA



Notice the hundreds of tents scattered through the city. They are set up to shelter the many devout Mohammedan pilgrims, who have come to pay homage at the shrine of the Prophet. As the pilgrims approach the city, they replace their traveling clothes with seamless wrappers, and walk in bareheaded and barefooted. The chief ceremony consists in kissing the "Black Stone" set in the wall of the Kaaba shrine, shown in the lower picture. Then they circle the shrine seven times, three times running and four times walking. Next they run up and down some of the sacred hills you see here, visit nearby holy places, and throw stones "at the devil" in the neighboring village of Mina. Once the ceremonies are complete the pilgrims acquire the honorable title of "Hajji," together with the privilege of wearing a special green turban.



Here are the pilgrims gathered about the Kaaba shrine in the courtyard of the Great Mosque. This shrine, according to legend, was built by Abraham. In one corner of it is set the "Black Stone," supposed to have been given by the angel Gabriel to Abraham. The Kaaba here is covered with black brocade, which is usually brought from Cairo as a gift from the Prophet's Egyptian followers. It is toward the Kaaba that all faithful Mohammedans in all parts of the world are supposed to turn at prayer time.

**MECCA, ARABIA.** From the days of Mohammed to the World War of 1914-1918, no Christian is known to have openly entered this holy city of Islam and returned to tell the story. Those who did are the handful of adventurous men who went there in disguise or protected by a temporary profession of Mohammedanism. But these few who succeeded in the attempt saw one of the most remarkable sights in the world. For an average of about 100,000 pilgrims from the whole Mohammedan world converge on Mecca in the 12th month of every Mohammedan year, on the sacred journey that every believer is enjoined to make at least once in his lifetime to the birthplace of the prophet.

Through the Suez Canal come the Egyptians bearing their gift of a costly black brocade for the sacred Kaaba, the cube-shaped stone sanctuary in the court of the mosque. Around by the Indian Ocean come the faithful from Java, India, Persia, and Zanzibar, who disembark at the Red Sea port of Jidda and join the slow camel caravans across the 45 miles between the coast and Mecca. Other caravans make the still longer progress down from Bagdad and Damascus, the wealthy pilgrims on camels, the poor on foot. Of late years, however, many have used the Hejaz railway from Damascus to Medina; and since 1927 King Ibn Saud has provided motor-bus transportation between Jidda and Mecca, and policed the route to protect pilgrims from Bedouin robbers.

The "forbidden city" lies hidden among barren hills in a valley where nothing grows. The sun glares down upon it, there is never a breeze, and the rains which sweep down from the hills once or twice a year often amount to cloudbursts that sweep away houses and damage the holy buildings. Photographs show that it is a city of rather European-looking dark stone houses, three to five stories high, built along streets that all slope to the Great Mosque—an immense open court surrounded by a colonnade—containing the windowless black-veiled Kaaba, the pulpit, and the sacred well of Zem-Zem.

Long before Mecca appears around a bend in the mountains, the pilgrim shaves his head and puts on

two white seamless garments in place of his traveling clothes. He wears these until after he has kissed the sacred black stone that is built into the southeastern corner of the Kaaba, and performed the other intricate ceremonies which occupy the next few days and reach their climax in a pilgrimage out to Mount Arafat, a half-day's journey away. Here the pilgrim takes his stand at noon on the ninth day of the pilgrimage month and recites prayers and texts till sunset—the most important ceremony of the whole pilgrimage, and the one which alone entitles him to the coveted title of *Hajji* ("pilgrim") for the rest of his life. At Mina, on the journey from Arafat back to Mecca, the pilgrims sacrifice an animal, throw stones at three pillars, which are believed to represent Satan, then shave their heads again and put on ordinary clothing. Every step of this sacred journey is attended by danger. Thousands die each year from hardship, or are killed by bandits, or are smitten by cholera and other epidemics that sweep through the multitudes as they crawl along the roads and stand closely packed on the sides of Arafat or in the inclosure about the Kaaba.

Mecca was a place of pilgrimage long before Mohammedanism. When Mohammed was born, in 570 A.D., it was a commercial town of some importance, lying on the ancient incense route from southern Arabia. It was also the center for a cult then widespread in Arabia; and the Kaaba with its black stone fetish, supposed to be as old as the world, was surrounded by 360 idols, one for each day of the ancient Arabian year. Mohammed kept the tradition and many of the ancient rites while doing away with the idols. He invented a legend which attributes to Abraham the building of the first Kaaba, and affirms that the black stone (probably of meteoric origin) came from Paradise with Adam and Eve.

Mecca, as part of the vilayet of Hejaz, was under nominal Turkish rule until the grand sherif of Mecca achieved independence during the World War. In 1924 Ibn Saud, sultan of Nejd, with his Wahabi followers took Mecca, and two years later was declared king. The population of Mecca is about 85,000.

## SIX PRINCIPLES *that Rule* ALL MACHINES

*The Simple Laws that Tell How Much Work Machines Will Do—Labor-Saving Devices Based Upon the Lever and the Inclined Plane—The Three Great Laws Discovered by Newton*

**M**ECHANICS. Little of the world's work could be done by the unaided hand. One of the first steps in human progress was the discovery that men could increase the efficiency of their hands by the use of tools embodying mechanical principles.

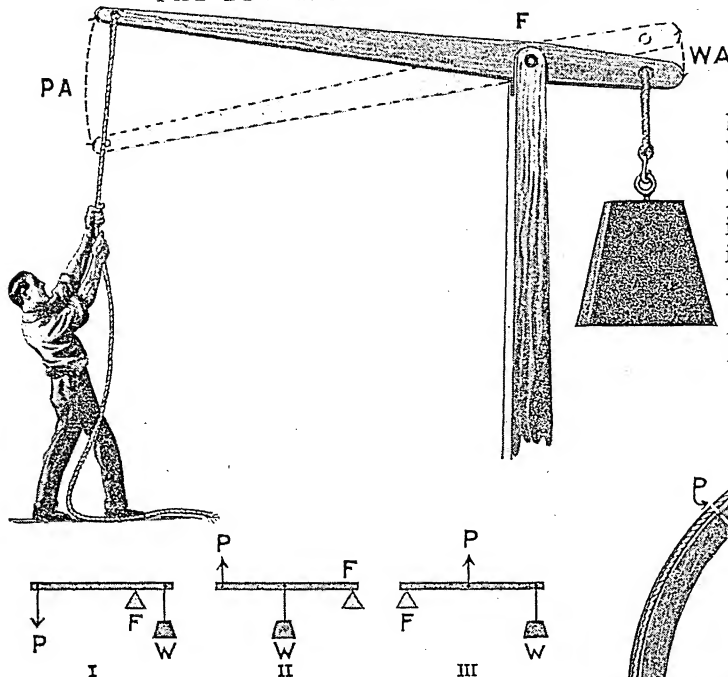
Primitive men must soon have learned that they could use sticks as *levers* to move stones too heavy for unaided human strength to lift. It was easier to drag the killed game home up the sloping side of a hill than to pull it straight up over the face of a

precipice; and some prehistoric inventor found that he could secure the advantages of an *inclined plane* by means of long smooth poles laid to slope from the mouth of his cave in the steep rock down to the level ground at its foot. When men found that sharp-edged stones would split wood and bone, they had discovered the principle of the *wedge*, which they presently turned to account in making axes, knives, arrowheads, and bodkins. A more deliberate ingenuity must have gone to the invention of the *wheel*



and axle, the pulley and the screw: but these six simple machines (the lever, the inclined plane, the wedge, the wheel and axle, the pulley, and the screw) had all been invented before the dawn of history.

#### THE LEVER AND ITS CHILD—



How can a man lift a 300-pound weight with a 100-pound pull? He can do it with a lever, provided the end he pulls is at least three times as long, and therefore moves three times as far, as the end which supports the weight. In the picture the distance moved by the "power arm" is indicated by PA; the distance moved by the "weight arm" by WA; and the fulcrum or point of support by F. According to the law of the lever, *power multiplied by power arm equals weight multiplied by weight arm*. Below the picture are the three kinds of levers: First Class (I), in which the fulcrum is between the power and the weight; Second Class (II), in which the weight is between the power and the fulcrum; and Third Class (III), in which the power is between the weight and the fulcrum. In the latter, we must imagine the lever as being fastened down to the fulcrum. In the Third Class levers, the power must be greater than the weight, for the weight moves through the greater distance.

We use them every day, both in the simple form and as elements in the most complicated mechanical devices such as the steam engine, the automobile, and the power printing press.

Archimedes first enunciated the principle of the lever—a rigid bar free to move about a fixed point called the fulcrum, used to raise a weight or to overcome resistance, which permits the power to count for more the farther it is from the fulcrum, the resistance remaining in the same place (see Archimedes). The auto jack, by means of which a child can raise one end of a car weighing a ton or more, the child's seesaw, and the crowbar are familiar examples; shears, tongs, and nutcrackers are double levers. Almost all locks are constructed on the lever-action principle.

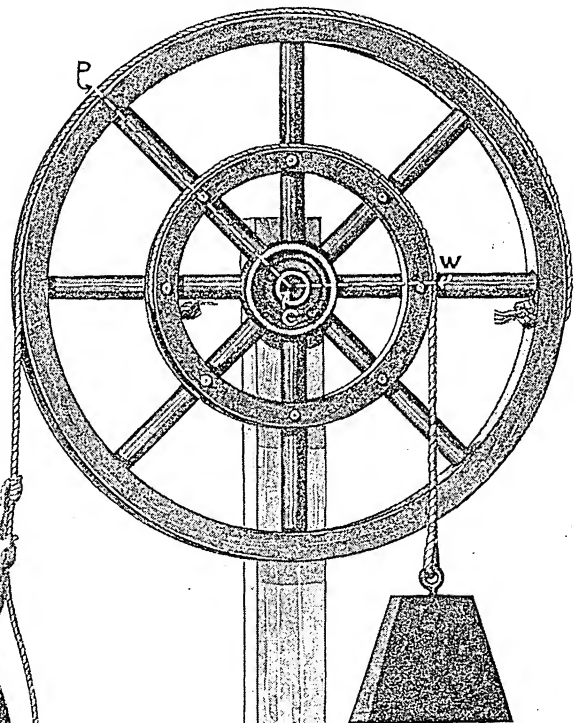
The Egyptians are said to have used the inclined plane in building the Pyramids, and draymen now use it in the skids with which they load heavy barrels into wagons. The wedge is a double inclined plane

at the back of which power is applied, and we use it in knives, axes, chisels, etc.

The wheel and axle, turning together about their center, form mechanically merely a special form of the lever; a small power applied to the rim of the wheel will balance a comparatively large weight depending from or pulling on the axle. Its applications are endless, as, for example, in the capstan, the windlass, and the innumerable combinations for transmitting power by toothed wheels.

The pulley, a wheel with a rim grooved to keep the cord from slipping off, is used to produce balance, as in balancing a

#### THE WHEEL



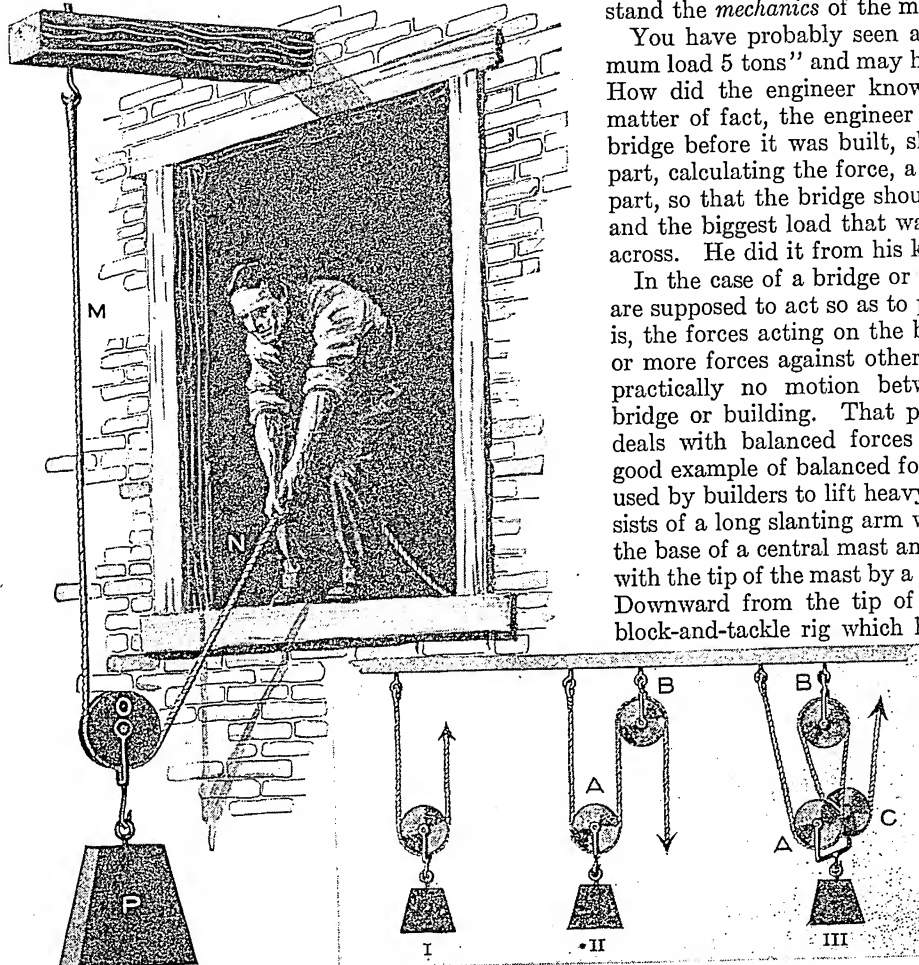
The wheel, or "wheel and axle," as the arrangement shown here is called, is an application of the lever principle. You can see at once how the axle of the wheel is nothing more than a permanent fulcrum, around which revolve continuous lever arms, represented by the wheel rims and spokes. In this case the power arm is measured by the distance CP, while the weight arm is measured by the distance CW. Among the advantages of the wheel over the plain lever is the fact that it can be made to operate through much greater distances, and the fact that power may be applied to the fulcrum (axle) as in the case of the driving wheels of engines and motors.

window-sash against a weight, or to change the direction of force exerted, as when a bucket or dumb waiter or elevator is raised by pulling down; but its most important use is to multiply mechanical advantage,

as in the combination of fixed and movable pulleys used in hoisting tackle, cranes, derricks, etc.

The screw is an inclined plane twisted around a cylinder, used to overcome great resistance or to exert great force, in almost as many ways as the wheel and axle. Besides the carpenter's screws and

#### PULLEYS AS LABOR SAVERS



In the larger picture the weight (P) is supported by the two ends of the rope (M and N) passing through a "moving" pulley (O). The man only has to pull against one-half the total weight for the overhead beam and its rope (M) supports the other half. However, to raise the weight he must pull in twice as much rope as he would if he lifted it directly, for he must shorten two ropes instead of one. This simple type of pulley is also shown in the diagram (I). The "fixed pulley" (B) in the next set (II) merely changes the direction of pull without multiplying the power, because the downward pull is not acting directly upon the moving or weight pulley (A). In Figure III there are four supporting strands acting directly on the weight through the moving pulleys (A and C), so in such an arrangement a given pull will move a weight four times as great. There is of course a corresponding loss in the space traveled by the weight. The fixed pulley (B) simply turns the rope back to pass through the second moving pulley (C), and does not affect the working power. The law of pulleys says that "the lifting power is multiplied by the number of strands acting directly upon the moving pulleys." In the block-and-tackle rigging all the fixed and all the moving pulley wheels are incorporated in two "blocks." The result is the same as in Figure III, where the wheels are shown separate for the sake of clearness.

bolts, we have the screw-press and the jackscrew, by which an immense weight, such as a house, may be raised by a comparatively small force.

These are the six fundamental "machines" of mechanics, that branch of physics which treats of the action of forces on bodies. But one of the most wonderful things in nature is that the same laws of forces that are true for common machines are used

to explain the most complicated occurrences in nature. Thus, to understand the action of such a complicated mechanism as an electric dynamo or an electric motor, we use the same laws that we do in explaining the lever, wheel and axle, and other simple machines. Every boy and girl should try to explain how the machines about him act, that is, to understand the *mechanics* of the machine.

You have probably seen a bridge marked "maximum load 5 tons" and may have asked the question: How did the engineer know the safe load? As a matter of fact, the engineer made a drawing of the bridge before it was built, showing the size of each part, calculating the force, a pull or a push, on each part, so that the bridge should carry its own weight and the biggest load that was to be allowed to pass across. He did it from his knowledge of mechanics.

In the case of a bridge or of a building, the forces are supposed to act so as to produce no motion, that is, the forces acting on the bodies are balanced, one or more forces against other forces, so that there is practically no motion between the parts of the bridge or building. That part of mechanics which deals with balanced forces is called "statics." A good example of balanced forces is seen in the crane used by builders to lift heavy loads. The crane consists of a long slanting arm whose base is fastened to the base of a central mast and whose tip is connected with the tip of the mast by a block-and-tackle rigging. Downward from the tip of the arm hangs another block-and-tackle rig which handles the loads. It is

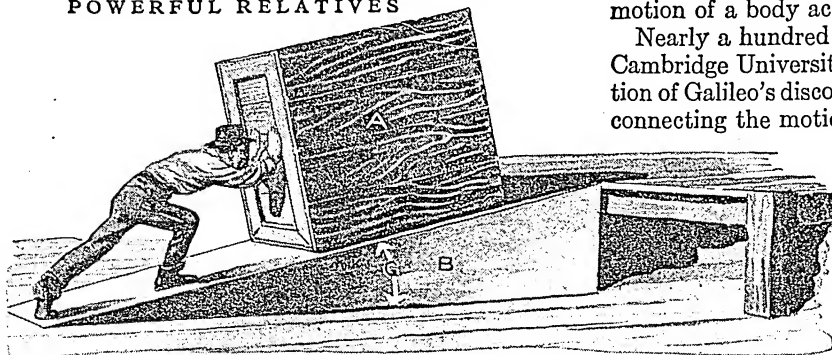
essentially a combination of the lever and pulley principles, by which weights may not only be lifted but swung around to any desired position.

When a force acting on a body is not balanced there is motion of the body. In the steam engine, the unbalanced force of the steam against the piston produces the motion of the piston and this motion is transmitted to the driving shaft, and thence by belts and pulleys, or cog wheels, to some machine tool.

In the locomotive, the unbalanced force through the coupling acts on the train of cars, and sets them in motion. That part of mechanics which treats of forces producing motion in bodies is called "dynamics" or "kinetics."

The simplest and most common case of an unbalanced force producing motion is that of an unsupported weight. It falls to the ground with a velocity

## THE INCLINED PLANE AND ITS POWERFUL RELATIVES



which increases uniformly; that is, with a constant increase or acceleration of speed. Starting from rest the body falls in one second 16 feet; in two seconds the distance fallen is 64 feet, or in 3 seconds 144 feet, etc. Its velocity increases 32 feet per second in each second. The force in the case of the falling body is the force of gravity or weight, that is, the attraction which the earth exerts on all bodies, the most universal and yet the most mysterious of all forces.

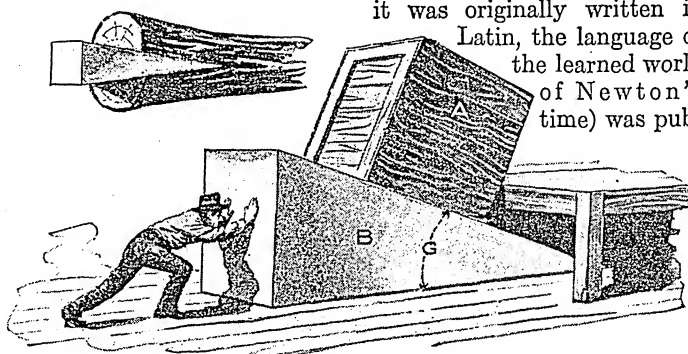
The wonderful progress which has been made in modern times in using the forces of nature to help man do his work and transport himself and his goods over the earth's surface was made possible by Galileo's studies of the most common of all motions, that of falling bodies (see Galileo). From his famous experiments on the leaning tower of Pisa and

similar experiments Galileo discovered the law of the motion of a body acted on by a constant force.

Nearly a hundred years later Sir Isaac Newton of Cambridge University, England, as a direct continuation of Galileo's discoveries, stated the completed facts connecting the motions of bodies and the forces. It

is said that Newton got his idea from watching an apple fall from a tree, thus showing that a common occurrence, when properly studied, leads to great results. Newton's great book, 'The Mathematical Principles of Natural Philosophy' (commonly called the 'Principia', from part of its Latin title, for it was originally written in

Latin, the language of the learned world of Newton's time) was pub-



Suppose a workman, who can lift 200 pounds and no more, has to raise a 400-pound box (A) to a platform. Obviously, he cannot lift it directly; but if he laid a long sloping plank—that is, an "inclined plane" (B) up to the edge of the platform, he could do the job easily, provided, of course, he got rid of excessive friction by putting rollers under the box. The principle of the inclined plane is that the smaller the angle (G) of the inclined plane, the easier it is to move the weight, although the weight must, of course, travel over a correspondingly greater distance. In the lower picture, the principle of the wedge is illustrated, which is simply our first inclined plane reversed, the sloping plane being driven under the object to be lifted.

lished in 1687. Upon its results are based all the principles and laws of modern dynamics.

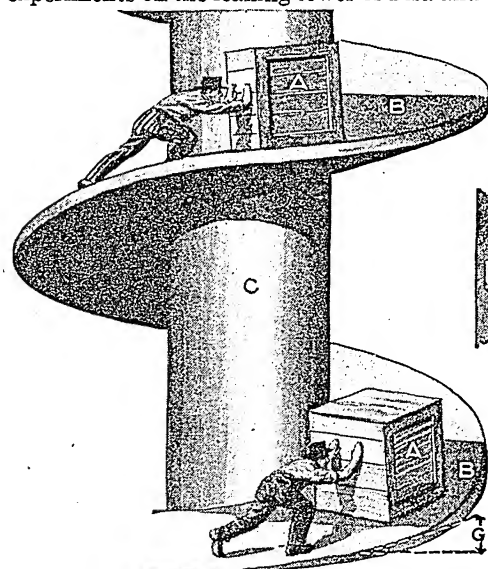
In modern mechanics, we study such subjects as the forces in rotating machinery, the pressures and speeds of flowing water and of whirling air, the flow and oscillation of electrons in the electric current, the vibrations of the ether in light waves, in wireless, and in X-rays; and all these varied motions depend upon the laws of dynamics derived from Newton's

famous three fundamental laws of motion. Newton's laws of motion say:

(1) Every body stays at rest, or, if in motion, continues moving uniformly in a straight line, unless acted on by an outside force. That is, matter has *inertia*.

(2) To set a body in motion, or to stop a moving body, the force required is greater, the greater the mass of the body, and also the quicker the body is started or stopped. Also the change of motion is in the direction of the acting force.

(3) To every force, there is a reaction.



Here we see the inclined plane in the most ingenious form of all—the screw. You remember how we showed that the wheel was simply a continuous kind of lever revolving around an axle? Well, in the same way, the screw is simply a continuous kind of inclined plane, winding around a central supporting shaft. The larger picture shows how our workman would look if he were following the thread of a giant screw. In the smaller picture we see how this principle is applied in the vise and similar tools.



**MEDES.** In the long-ago days when the mighty Assyrian Empire was at the height of its power, there grew up on its borders, in the mountainous land southeast of the Caspian Sea, another power which steadily became more dangerous—the kingdom of Media. In contrast to the Assyrians, who were Semites, the Medes belonged to the great Indo-European family, from which we ourselves and our neighbors in Europe are descended.

Once tributary to the Assyrians, these people, simple in their habits and strong in body, had won their independence and were gaining in strength, while their former masters became weakened through wealth and luxury. At length the Medes in 606 B.C. swept down from their heights on Nineveh, the Assyrian capital, laid that splendid city in ruins, and overthrew the Assyrian Empire.

For a brief time the Medes were the greatest power in western Asia. But among their vassals were the Persians, another Indo-European people, who were, like the Medes, followers of the religion of Zoroaster and similar to them in language and customs. And now again the subject state became the ruler, for Cyrus the Great, king of Persia, about 558 B.C. seized the throne of the Median king Astyages. In course of time the two peoples were merged into one and henceforth history tells us no more of the Medes as a separate people, but of "the Medes and Persians." (See Persia.)

**MEDICI** (mēd'i-chi). In the stirring days of the Renaissance many families rose to princely power over Italian cities by force of arms, intrigue, and assassination, and their heads ruled as undisguised despots. The Medici of Florence, on the other hand, the most eminent of all in their princely patronage of art and literature, rose chiefly by their wealth derived from commerce and banking and for a century concealed their absolute rule under the popular forms of a republic.

Giovanni de' Medici (died 1429) was the real founder of the wealth and power of the family. His son Cosimo (1389–1464) did a vast banking and commercial business by means of his branch houses in Rome, Venice, Geneva, Bruges, London and elsewhere; at the same time he ruled Florence through his skill in securing the election of his own creatures

to the chief offices in the city. His position was not unlike that of an American party boss, who corruptly rules a city or state by all sorts of underhanded tricks and favors, without ever himself taking office. But Cosimo was a generous patron of art and literature and his palace became an asylum for Greek scholars exiled by the fall of Constantinople in 1453.

With Cosimo's grandson Lorenzo the Magnificent (1449–1492), the glory of the Medici reached its height. He escaped the fate of his younger brother Giuliano, who was stabbed to death at high mass in a church as the result of a plot of their Florentine enemies, to which Pope Sixtus IV was also a party (1478). Lorenzo continued his father's policy of disguised rule, and even excelled him in the magnificence of his patronage of men of letters and artists, including the youthful Michelangelo. Lorenzo himself was a man of learning and a poet of real originality, but his verses were often scandalous in their subjects. He was also the wisest statesman among Italian princes of his day.

Lorenzo's influence at Rome enabled him to secure the election as cardinal, at the early age of 14, of his second son Giovanni. Later this son became pope as Leo X (1513–1521), and gained fame as one of the most liberal popes in the patronage of the fine arts; in Leo's day, also, began Luther's revolt in Germany. Leo's cousin Giulio, with whom he

was reared in Florence, also became pope a little later, as Clement VII (1523–1534).

The later Medici (after 1531) abandoned the forms of a republic at Florence and assumed the title of Duke of Florence. In 1537 Cosimo the Great succeeded to the duchy, annexed Siena to his domains, and received from Pope Pius V the title of Grand Duke of Tuscany. The Medici continued to rule under this title until 1737, when the family became extinct.

Catherine de' Medici (1519–1589), great-granddaughter of Lorenzo the Magnificent, became the wife of one French king (Henry II) and the mother of three others—Francis II, Charles IX, and Henry III. She was ambitious to keep undiminished for her sons the power of the French monarchy. France was torn by religious wars and in the minority of her sons Catherine intrigued now with the Catholic party, now with the Huguenots, and was chiefly responsible for the terrible St. Bartholomew's massacre of Aug. 24, 1572. (See Coligny, Gaspard de.)

LORENZO, DUKE OF URBINO



Michelangelo made this statue of Lorenzo, Duke of Urbino, grandson of Lorenzo the Great, to adorn the Medici chapel in the church of San Lorenzo.

## HELPING *the* BODY to CURE DISEASE

*How Modern Medicine Seeks to Prevent Sickness—The Folly of Treating Symptoms  
When the Cause of the Ailment is Unknown—What Diagnosis Means—  
Various Forms of Treatment—The Long History of Medicine*

**MEDICINE AND SURGERY.** One of the greatest triumphs of the human mind is the development of medicine, and no branch of science has contributed more to mankind's welfare and happiness. Medicine is the science and art that prevents, cures, or alleviates disease, and repairs injuries or defects of the body. The word "medicine" is also applied in popular speech to the drugs and other chemicals that medical men use. Surgery is the branch of medicine in which the repairs or alterations of the body are performed by hand or with instruments.

If our knowledge of medicine were perfect, perhaps we could prevent all diseases. Even with the present knowledge thousands of lives are saved annually through the control of typhoid fever, smallpox, yellow fever, lockjaw, rabies (mad dog bite), and other diseases that used to kill many people every year.

Healing disease is more difficult than preventing it. The body really cures or attempts to cure itself. All the doctor can do is to help the body cure the disease. But this is very important, because often the body could not do it alone.

### The Disease and Its Symptoms

People are often deceived about curing disease, because they confuse the symptoms with the disease itself. For example, if you have an aching tooth, which means a diseased tooth, and if you put in something that stops the pain, you do not cure the disease at all. The tooth must be properly treated by a dentist. Probably the best he can do is to stop the disease for a time by digging out the decay and filling the cavity with some protective material. This illustrates the third part of our definition of medicine, namely, "alleviation." Very often the body cannot cure the condition even with the best aid of physicians. The best that the art of medicine can accomplish in such instances is to help the person to get along with the disease and prevent it from doing more harm than is necessary.

In order to help a patient the physician must first of all find out what is wrong with him; that is, he must make his "diagnosis." To diagnose a case correctly the physician must know how to search for and recognize the symptoms of all the diseases he is likely to encounter. Then he must know what treatment will cure each disease, or will relieve the patient if cure is impossible.

Each one of these three things has been very hard to find out. Mankind has only slowly learned through ages of study something of the nature of disease.

First it had to be discovered how the body is constructed (Anatomy) and how it works (Physiology). The body works as a chemical machine, so physiology has to depend on chemistry. Then men had to learn

what disease does to the body—how it changes the body. This science is called Pathology. Knowledge of these sciences slowly accumulated through the ages. In the last 300 years progress has been faster.

It is only within the last 75 years that we have known much about the cause of disease. The germ diseases are the best known. These are caused by the growth in the body of very minute plants or animals. The plants are called bacteria (*see* Bacteria). Each germ disease has its own kind of germ, or rather each kind of germ causes a particular disease. The growth of these foreign organisms or parasites destroys or injures the part of the body where they locate. Often they produce poisons which go into the blood and injure distant parts of the body. These injuries, direct or indirect, are the disease. The pain, fever, weakness, etc., are caused by the disease but are not the disease itself. Pasteur, a great Frenchman, was the first to prove that certain diseases are due to germs. Now we know that diphtheria, typhoid fever, tuberculosis, and numerous others are germ diseases (*see* Germ Theory of Disease). Others appear to be due to deficiencies in diet, for example, rickets. Some are due to over-production or under-production of some natural substance in the body, for example thyroid diseases. But there are some diseases, for example, cancer, for which the cause is not yet known.

The recognition or diagnosis of the particular disease a person has is often very difficult. The doctor must have a thorough knowledge of anatomy, chemistry, physiology, and pathology. He must have had a thorough training in the signs and symptoms, which vary greatly under different conditions. He must apply various chemical tests, use the microscope, X-ray examinations, etc. Diagnosis is the most difficult branch of medicine.

### You Must Find the Cause before the Cure

When the disease has been properly recognized or diagnosed, then only can it be treated with some assurance of really helping the body to cure itself. But if the disease is one whose cause is unknown, the doctor is greatly handicapped. Only in a few instances has an adequate remedy been found for disease of unknown causation. When the cause is known, however, the chances are better. In a few cases scientists have found chemicals (drugs) which will pick out and kill the germs in the body without killing the body cells, as, for example, quinine kills the germs of malaria. Such a remedy, which cures or prevents some particular disease, is called a "specific." In other cases, as diphtheria, they have found antitoxins that will neutralize or destroy the poison created in the body by the disease germs. In some diseases due to lack of some substance in the body, that substance

has been discovered and supplied. The number of specific remedies is not large, but it is slowly increasing, which is a hopeful sign for the future (*see* Drugs).

Surgery is another method of treating disease. Sometimes the diseased part may be cut away entirely. Sometimes clogged tubes, for example, the intestine, may be opened and cleaned out. Sometimes displaced parts are rearranged in their proper places. Surgery has improved wonderfully in the past 50 years. This is chiefly due to the invention of anesthetics and to the discovery of "asepsis," which merely means the carrying on of operations in such a way that no germs can enter the wounds.

Some diseases are due to wrong foods and the diet needs correction. In some diseases, like influenza or "flu," rest in bed is the best treatment known. Rest is simply giving the body a full chance to cure itself. In other diseases, not rest but exercise is needed.

The mind has an important influence over the body. Hence mental therapy is often valuable. There are, in fact, countless cases of physical disorders induced by worry, nervous strain, or mental shock, as well as purely imaginary ailments, all of which call for mental therapy. But the science of medicine makes a sharp distinction between such nervous troubles and the diseases which demand physical treatment.

Massage and manipulation of the joints are frequently valuable in establishing a better circulation of blood and lymph and therefore in helping the body to cure itself. But in other conditions they do harm. Baths, X-ray, and radium are other methods of treatment for particular conditions.

#### Why Doctors Differ

We see, therefore, that science has discovered many different methods of treating disease. All of these are parts of medicine in the true sense of the word. We see also that there is only one science of medicine. All well-trained physicians use the same treatment whenever a real adequate cure has been found. For example, all kinds of doctors use antitoxin for diphtheria; all kinds of doctors set a leg when it is broken; all kinds of doctors use cylindrical lenses for astigmatism. It is only in diseases where the cause and cure are not known that doctors differ to any great extent. The reason they differ is that no one really knows in these cases whether he is helping nature or not by treatment. Each doctor thinks his treatment is good because most of his patients get well. But they would probably get well anyway.

That is the reason that so many cults or schools of medicine have flourished. Among savage tribes the chief was often "medicine man." Various rites, incantations, dances, and drumming were used to get rid of the demons that were supposed to cause disease. The sick people often got well, so they believed in the treatment. In ancient Egypt the priests of the Egyptian gods were the physicians. In Greece Aesculapius was the god of medicine. When people got well, they believed in these gods. And so it has always been, no matter how absurd the treatment.

Hippocrates, born 460 B.C., is called the father of medicine. He was the first to carefully describe symptoms and diseases. This was a great advance, but the causes of disease were still absolutely unknown. Hence various sects arose, depending on the theory of disease or treatment which was adopted. There were the "dogmatists," and "empiricals," and "methodists," and "humoralists," and "solidists," and various others in ancient and medieval times. The "allopaths" believed that remedies should be unlike the symptoms. The "homeopaths" believed that remedies should be similar to the symptoms. More recently the "osteopaths" asserted that diseases were caused by wrong adjustment of bones; and the "chiropractic" theory holds that disease is caused by displacement of the vertebrae and the resulting abnormal pressure on the nerves.

#### The New Spirit in Medicine

All these differences, so far as they are important, are differences in belief or theory in regard to diseases whose cause and cure are not yet known. As has been said, when a real specific treatment has been discovered and demonstrated, all doctors, as sensible men, use it. It is just like automobile doctoring. All mechanics will repair your car the same way when they know what the matter is. But some mechanics are better than others in finding out the trouble.

Medical students nowadays never hear anything about "allopathy" or "homeopathy" or any other "pathy." They are taught to observe, and to know at first hand the body and its ailments. They are taught that beliefs don't help you; it's what you *know* that enables you to recognize and cure disease.

If anyone should read this article and think he would like to be a doctor, let him not waste any time deciding whether he will be a "regular," or a "homeopath," or an "osteopath." Rather let him decide whether he would like the doctor's life and whether he desires to serve mankind in that capacity. If he decides in favor of being a physician, let him get the best training he can in general knowledge, and especially in the sciences that underlie body activity in health and disease. These sciences are biology, chemistry, physics, and psychology. The prospective student should study these at least two years in a good college. Then he should go to a university where good training in anatomy, physiology, bacteriology, and pathology may be obtained. He should study disease in a large hospital where all kinds of diseases are found. Such a man will recognize and treat disease as the result of observation and judgment and not because he holds some theory or belief. It will not matter either to him or to his patients what he calls himself.

**MEDITERRANEAN SEA.** Thousands of years ago the Mediterranean was the center of the world and its first school of navigation. Today, with Asia and Africa assuming new importance along its shores and Europe in new rivalries, the Mediterranean becomes again a center of the world's interest. In other articles



is told the story of the empires and peoples that have lived and still live on its borders. Here we can give only the chief physical facts of this largest inland sea in the world.

The Mediterranean is 2,300 miles from end to end, only 1,200 miles at its broadest from Venice to the Bay of Sidra, and 300 on an average, and at the highest estimate only 1,145,000 square miles in area. It is almost entirely inclosed by Europe on the north and northwest, Africa on the south and Asia on the east, with a narrow opening into the Atlantic at the Strait of Gibraltar and another narrow opening into the Black Sea at the Dardanelles. In summer the northeast trade-winds blow over it and in the winter the prevailing winds are westerly. Under bright blue skies, and over a dark blue sea, with fragrant land winds blowing far out over the waters from fertile shores, and with island after island almost in sight of one another to lure him on, primitive man ventured from end to end of it in boats which were probably just a hollowed log propelled by paddles.

#### Early History of the Mediterranean

Remains of the times before recorded history are found in a hundred places on its coasts and islands, and even past the Strait of Gibraltar. The first venturers known to history, however, were the Phoenician traders who established commercial colonies here and there along the shores and islands as far west as Cadiz in Spain. The Phoenicians were followed by their daughter colony Carthage. The Greeks colonized too, and the Sicilian tyrants sailed the Mediterranean in barges luxurious with statues and fountains. Later the sea became simply a Roman lake, and everywhere about its shores, whether in Europe, Asia, Africa or the islands, you will still find ruined temples, baths, and aqueducts, to remind you of the empire. In all times the Mediterranean has been infested by pirates as well as by peaceful traders and colonists. In our own day the submarine warfare gave Mediterranean navigators a taste of what their ancestors experienced in the Middle Ages when Christian and Saracen, Berber pirates, Genoese sailors, Spaniards, and Knights of Malta boarded one another's ships, and fought for control of the waters which in those days carried most of the world's commerce.

Various parts of the Mediterranean are known by various names, the part east of Crete as the Levantine Sea, that which separated Turkey in Europe and Greece from Turkey in Asia as the Aegean, that between the west coast of the Balkan Peninsula and Italy and Sicily as the Ionian, that between the east coast of Italy and the west coast of Turkey and Dalmatia as the Adriatic, and that between the west coast of Italy and the islands of Sardinia and Corsica as the Tyrrhenian or the Tuscan Sea. There are really only two basins, however, divided by the Italian peninsula, which nearly touches Cape Bon in Africa, with Sicily in between and a high ledge covered only a few yards deep by the sea. This barrier is a center of volcanic activity, marked by Vesuvius

in Italy, Etna in Sicily, and Stromboli thundering down great balls of lava on the Lipari Islands. This subterranean seething has sometimes cast up islands almost overnight. The greatest depth in the eastern basin is 14,400 feet, south of the Morea; and in the western basin, 12,200 feet, east of Sardinia. At Gibraltar the depth is 2,500 feet and 50 miles out only 1,200. The chief islands of the western division are Sicily, Sardinia, Corsica, and the Balearic group, and in the eastern Cyprus, Rhodes, Crete, the Ionian Isles, and Malta.

Were it not for the stream flowing in from the Atlantic, the Mediterranean would no doubt dry up in a short time to a salt desert like the former seas of Asia, for the sea loses three times as much by evaporation as it gains from the few great rivers that flow into it, the Ebro, Rhone, and Po from Europe, and the Nile from Africa. From the Black Sea—replenished by several great rivers—there is also a strong current. The Suez Canal opened in 1869 connects it through the Red Sea with the Indian Ocean and restores the Mediterranean to the old place as a link in the route to India and the Far East. The Mediterranean contains 400 species of fish, about twice as many as any other sea. Sponge, tunny, and sardine fisheries are important, and divers bring up a wealth of red coral on the coasts of Provence, the Balearic Islands, Sicily, Tunis, and Tripoli.

**MEERSCHAUM** (*mēr'sham*). The name of this mineral is borrowed from the German and means "sea-foam." It is a white or cream-colored claylike substance, which when dry will float on water. When first dug from the earth it is soft, like soap, and it makes a lather in water, and takes out grease; chemically it consists of hydrated magnesium silicate. In Europe it is found in Moravia, Spain, and the Crimea, and in Asia Minor there are large beds of it just below the soil. It is also found in South Carolina.

The best quality comes from Asia Minor. It is mined in blocks about a foot each way, and is carefully packed in cotton to avoid damage in shipment. Meerschaum pipes being porous absorb color from the burning tobacco and take a high polish. Vienna and Paris are the manufacturing centers.

**MELBOURNE** (*mēl'bārn*), AUSTRALIA. The young city of Melbourne was growing at a steady but not remarkable rate along in the 1840's. In 1851 enormous gold fields were discovered near by, and Melbourne's story became the dazzling one of a great gold-mining center. Today the beautiful city, in the center of a highly productive agricultural region, is notable for its manufactures and is a shipping point for wool, wheat, wine, fruit, and other products. The second largest city in Australia, Melbourne is the capital of the state of Victoria, which is in the extreme southeastern corner of the continent.

The site of Melbourne was first settled in 1835 by pioneers from Tasmania who were seeking more extensive pasture lands for their flocks and herds. They "bought" the land from the natives in exchange for

## AUSTRALIA'S SECOND CITY AND ITS QUIET RIVER



Melbourne's main business district, with its fine modern office buildings, here overlooks the banks of the Yarra River. At the left is Princess Bridge. The building with the dome in the center of the picture is the Flinders Street railway station. To the right rise the graceful spires of St. Paul's Cathedral. The little white launches at the water's edge are Melbourne ferries waiting to take you for a pleasant ride upon this tranquil stream.

some trifling gifts. In 1837 it received its present name in honor of Viscount William L. Melbourne, who was British prime minister from 1834 to 1841. It was a small, thriving settlement by 1841, was incorporated a year later, and became a city in 1848. In 1851, when the great gold deposits were discovered not many miles away, the city became the center of a great boom. Within ten years its name was known around the globe, and for a period of more than 40 years it was the most populous city in all Australia.

People from all walks of life hurried to join the gold rush. Even government officers and policemen deserted their work to seek a quick fortune, and public officials had to offer increases in salary to maintain their forces. Within the first ten years of their development the mines near Melbourne produced an average of more than \$50,000,000 worth of gold a year.

Far-sighted planning and the work of expert surveyors assured Melbourne ideal conditions for growing into a great city. Some of its streets are 99 feet wide, and are lined with palm trees. It is justly proud of its beautiful Botanical Gardens and other parks, its public buildings, churches, library, national museum, and art gallery. There are miles of beaches and choice picnic spots for leisure hours. The Yarra River is the scene of the celebrated annual regatta and water carnival. The Melbourne Cup race rivals that of Epsom Downs in England. More than half the people of the

state of Victoria live in the city of Melbourne and its suburbs. Population of Melbourne (including the suburbs), about 1,000,000. (See also Victoria.)

**MELONS.** Every autumn the little town of Rocky Ford, Colo., in the center of a famous district which helps to make the United States the largest melon-growing country in the world, holds a gala "melon day." Championship contests are held to determine who can eat a melon the fastest and who can eat the greatest number. Rocky Ford has been noted for its melons since about 1900, when it started shipping carload lots to distant markets.

Melons are generally oval-shaped fruits, growing on vine-like plants. A protective outer skin covers their thick fleshy pulp, which in turn encloses the many seeds. The surface may be smooth or grooved. Since ancient times melons have been grown in the warm regions of Europe, Asia, and Africa. Many varieties are cultivated today in the temperate and warm regions throughout the world. In addition to their use as fresh fruits, melons are also used as pickles

and preserves. The two types of melons which are the most popular are the muskmelons and the watermelons.

#### The Fragrant Muskmelon

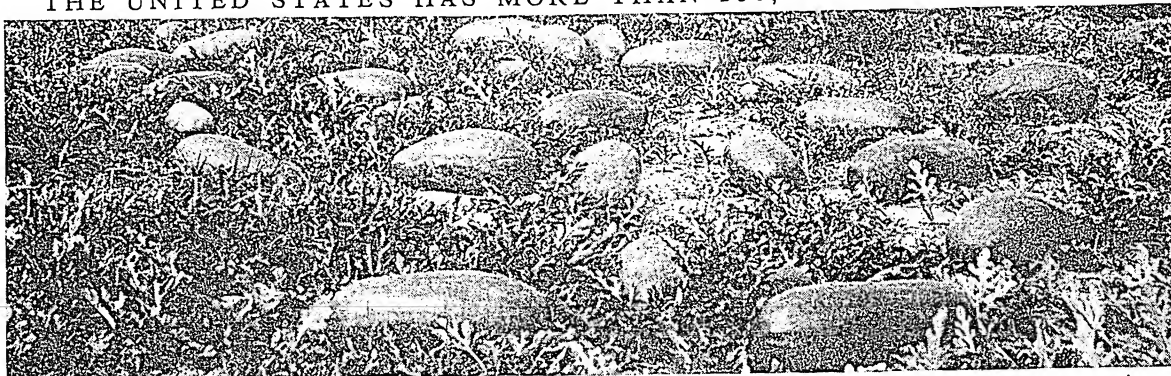
Muskmelons are so called because they have an aroma suggestive of musk. The chief producing areas in the United States are in California, especially in the Imperial Valley; in Colorado, the home of the famous Rocky Ford varieties; and in Arizona, Georgia, North

#### ROCKY FORD TWINS



Here are two excellent reasons for the fame of the Rocky Ford district in southeastern Colorado. These are fine examples of the netted muskmelons grown there.

THE UNITED STATES HAS MORE THAN 250,000 ACRES OF THESE



Watermelon fields such as this dot the warmer sections of the United States. Watchful care has prevented these fine specimens from falling prey to the harmful insects or destructive diseases that often attack the fruit. Watermelons are shipped as early as April from the South; the winter varieties are sent out from California and Colorado as late as December.

Carolina, Maryland, New Jersey, and Arkansas. California provides about half the total shipments. Muskmelons are customarily divided into two groups: the netted or nutmeg melon, and the winter or Cassaba melon. People engaged in the muskmelon trade usually apply the word "cantaloupe" (also spelled "cantaloup" or "cantelope") to the netted melon, or even to any muskmelon. However, the true cantaloupe, or rock melon, named for Cantalupo, Italy, where it was first grown, is almost unknown outside of Europe.

The netted melons fall into two groups: the Defender group and the Netted Gem group. The former have green rind, deep salmon flesh, and are sweet flavored. Some of the varieties are Paul Rose, Admiral Togo, Hale Best, and Hearts of Gold. Outstanding in the Netted Gem group are the melons developed at Rocky Ford. Netted Gem melons are solidly netted, and have salmon, golden, or (as in the case of the Honey Ball) green flesh. Varieties are Pollock, Edwards Perfecto, Abbott Pearl, and Honey Ball. In home and market gardens other varieties are grown.

Of the winter melons, the Cassaba is among the best known. It was first grown at Cassaba, near Smyrna, in Asia Minor. The name is now often applied to the whole group of similar melons. It is very sweet, relatively smooth and thin-skinned, greenish yellow outside and white or green within; it ripens late and keeps well in cold storage. It grows best in hot, dry sections. Varieties are Golden Beauty, Santa Claus, and the well-known Honey Dew. The latter is a large smooth melon of exquisite flavor, greenish white outside and deep green within; it stands shipment and storage well.

Muskmelons grow best in well-watered sandy or clayey loam soils. Warm, sunny locations and a dry atmosphere produce the finest fruit.

#### The Juicy Watermelon

The watermelon is a much larger fruit with smooth, dark-green spotted or striped rind. It probably gets its name from the fact that it has an abundance of watery juice. In the United States the chief producing areas are in Georgia, Florida, Texas, North and South Carolina, Virginia, Missouri, and California.

Watermelons weigh from about 18 to 50 pounds, or even more—the record weight being about 200 pounds. A standard watermelon for shipping weighs about 33 pounds, though smaller or larger ones are also shipped. The pulp usually ranges from pink to a rich scarlet, though it may be yellow or white. The varieties having red flesh that is firm, crisp, and sweet, with as few seeds as possible, are the ones usually cultivated for shipment. Among the best standard varieties are Tom Watson, Thurmond Grey, Irish Grey, Excel, Florida Favorite, Klondike, and Dixie Queen.

The melon belongs to the gourd family *Cucurbitaceae*, which includes also cucumbers, squashes, and pumpkins. Scientific name of muskmelon, *Cucumis melo*; of watermelon, *Citrullus vulgaris*.

**MEMNON.** In Greek mythology, Memnon was the son of Eos (Aurora), goddess of the dawn, and king of the Ethiopians. He came to the aid of Troy toward the end of the Trojan War, slew Antilochus, the son of Nestor, in single combat and was himself slain by Achilles. The colossal statues of King Amenhotep III of Egypt found near Thebes were supposed by the Greeks to be sacred to Memnon. Two of these still stand. One of them, after its partial destruction by an earthquake in 27 B.C., was said to give out musical notes at sunrise. Modern travelers who have heard the sound ascribe it to the rapid passage of the air through the pores of the stone when heated by the rays of the sun. The Greeks called it the voice of Memnon hailing his mother.

**MEMORIAL DAY.** Each year every state in the Union sets aside a day to commemorate the services of the soldiers and sailors in the Civil War and, since 1898, of those in the Spanish American and other wars also. The custom arose from the practise in the South of decorating the graves of the Confederate dead, whence came the name "Decoration Day." Today it is observed in all states, North and South alike; and in most of the states on the same day—May 30. In many localities the day has come to be a commemoration for all dead, and graves even of those who were not soldiers are decorated with flowers and wreaths.



**MEMORY.** Remembering is one of the most important things you do. Yet ordinarily remembering is done with so little effort that you may not realize how complicated it actually is. Psychologists define memory as the knowledge of an event or fact coupled with the further knowledge that the particular event or fact has been experienced at some time in the past.

To understand memory, we must split up the process into its several phases or parts. Of these the first is called *association*. This means the coming together of the two experiences so that the thought of one brings up the thought of the other. As I was walking down the street one day two automobiles collided at the corner of Main and First streets. Whenever I pass that corner I think of the collision. I do not think of it when I pass another corner, because no association was made between the other corner and the collision.

The second phase of memory is known as *retention*, and refers to your power to retain associations in your mind. It varies from individual to individual, and seems to be based upon a native quality of the nervous system. The opposite of retention is forgetting. We forget most in the first hour, less in the next, less in the next, and so on. After the first 24 hours, the rate of forgetting is relatively slow.

A student studying French, for instance, finds that he learns the meaning of 50 French words one day; the next day most of the words will be forgotten. If, however, he practises the forgotten words the next day, and on succeeding days, in the course of time he will master the list completely. In school we do not study arithmetic for one whole day, grammar the next day, and geography the next day, but we study arithmetic, grammar, and geography each day for short periods, in order that we may reinforce the memory bonds which have been weakened through the rapid forgetting that takes place during the first 24 hours.

The third phase of memory is usually spoken of as *recall*, and refers to the ability of the individual to bring up, under the appropriate circumstances, that which has been associated and retained. If I ask you a question such as "What is 9 times 6?" you may immediately say "fifty-four," thus recalling what you have previously learned and have retained. On the other hand, you may be unable to give an answer at the immediate moment, yet a few minutes later recall perfectly, thus indicating that the material has been retained.

The ability to recall under appropriate circumstances is obviously the test of memory. Thinking of the answer to a question in your examination paper after you have left the room is of little value in comparison with thinking of the answer when the question is asked. The ability to recall depends in large part upon the number of associations which have been formed with the particular fact to be recalled. The great opportunity for improving memory lies here. Each association forms a "handle" by which to pick out of the storehouse of your brain the fact you need.

The fourth phase of memory is called *recognition*, and refers to the "tagging" by which we assign the experience a place in our earlier life. It is the feeling of "pastness" or familiarity. Ordinarily, recall and recognition go hand in hand; occasionally, however, recognition occurs without recall. A face may be familiar, yet call no name to mind.

In the experimental work upon memory, two types of material are used: first, nonsense syllables composed of two consonants with a vowel between, such as *ken*, *tih*, and *yan*; second, meaningful material such as prose and poetry. It is found that a much greater proportion of the meaningful material than of the nonsense material is retained. In other words, learning by rote is much less effective than learning by means of logical connections. The better you understand a thing, the better you will retain it.

Persons differ in the kinds of things they remember easily. Some remember things they have seen better than things they have heard, while others may do the reverse. In good teaching, an attempt is made to present the material to the student in various ways: he reads about it in a book, he discusses it in classes, he looks at diagrams and illustrations, and in some courses he actually works with the material in the field, the laboratory, or the shop. All these methods multiply the handles of association with which a person can grasp the required fact when need arises.

#### Simple Ways to Improve Memory

Instead of the complicated systems for improving the memory which have been exploited for commercial purposes, modern psychologists rely on a few simple principles. Of these the first is that repetition tends to fix associations. "Over and over again" is the best rule. But repetition is not sufficient. It is necessary to concentrate your attention upon what you are trying to learn. You cannot learn a poem if you are thinking of a baseball game. Interest in what you are learning is essential.

The difference between rote memory and logical memory brings forth several additional principles. Of these the first is that a good memory depends upon a wise selection of what is worth memorizing. Many people learn too many insignificant details. Selection, thinking, and perspective are as important in memory as in other phases of life. Of two men with an equal array of facts at their command, one may be much more efficient than the other, because he remembers the important and essential, while the other remembers the trivial and insignificant.

Perhaps the foremost principle of efficient memorizing is the principle of recall during memorizing. If immediately after reading, the student closes the book and tries to recall what he has read he will find his ability to retain much increased.

If you outline what you are learning, run it over in your mind, discuss it with a friend—in other words, *do* rather than merely *receive*—you will find your memory greatly improved, particularly if the practise is kept up. (See also Learning; Study.)

**MEMPHIS, TENN.** The largest city of Tennessee is in the southwestern corner of the state, on the Fourth, or Lower Chickasaw, Bluff overlooking the Mississippi River. This is the southernmost of the series of bluffs on which the Chickasaw Indians built their villages before they sold their lands to the white man. Here De Soto is believed to have first seen the great river, in 1541, and here he built the boats in which he crossed it.

The position of Memphis midway on the Mississippi and its superior transportation facilities by rail and barge line have made it one of the South's great commercial and industrial cities and one of the busiest river ports in the country. Two bridges carry a heavy traffic across the river. The rich alluvial farm and forest region of western Tennessee, eastern Arkansas, and northern Mississippi send their cotton and lumber to Memphis. The city is one of the world's greatest inland cotton markets and one of the greatest hardwood lumber markets. In the manufacture of cottonseed products it leads the country. Furniture and other wood manufactures, and stock and poultry feeds are other important products.

The principal avenues radiate from the river past Crosstown, the business area, to join the Parkway, which makes a half circle around the city. At the river front it meets Riverside Drive. The largest of the many wooded parks lie along these drives. In Overton Park are the Brooks Memorial Art Gallery and a zoölogical garden with a free circus for children.

The University of Tennessee maintains its colleges of medicine and dentistry and its schools of pharmacy and nursing in Memphis. Here too are Southwestern, and the West Tennessee State Teachers College. The Cotton Carnival attracts thousands of visitors every May. Beale Street, center of the Negro district made famous by W. C. Handy, Negro composer of "blues" songs, has its own Cotton Pickers' Jubilee.

During the 17th and 18th centuries French, English, and Spaniards contested for this commanding site. In 1818 the Indians ceded their lands to the United States. The next year a settlement was laid out, which was incorporated as a town in 1826, and granted a city charter in 1849. It was named Memphis after the famous ancient Egyptian city, because of its situation, like the city of the Nile, on a great river. During the Civil War Memphis was the scene of an important naval battle, which resulted in its capture by Union forces. The city's progress was impeded by terrible epidemics of yellow fever that ravaged it in 1855, 1867, 1873, 1878, and 1879. During the epidemics of 1878 and 1879 fully two-thirds of the population fled, business was almost paralyzed, and the city was

on the verge of bankruptcy. Memphis has now established a reputation as a very healthful, progressive city. The government has been by commission since 1909. Population (1940 census), 292,942.

**MENDELSSOHN, FELIX** (1809-1847). Most great musicians have become famous in the face of handicaps, but in the case of Mendelssohn-Bartholdy (to give him his full name) there was never a day when he lacked anything that money or friends or education could supply. His parents were wealthy and cultured Jews whose home in Berlin was a meeting place for artists and scholars. At the age of four his lessons in music began, and at the age of nine he composed pieces for the family orchestra. At 15 he composed and directed a three-act opera that took his audience by storm. When soon after in London he played his 'Symphony in C' in concert, people from the audience leaped upon the stage to congratulate him.



MENDELSSOHN

The account of Mendelssohn's life is a story of pleasant and profitable work. His wonderful ability to extemporize and his willingness to play the compositions of other musicians made him a popular concert performer. His compositions were always in demand. In Germany he was idolized by all music lovers, and in

other countries he was always received with acclaim.

His happy marriage duplicated the home experiences of his youth. Among the friends of his manhood were such as Jenny Lind, Robert Schumann, Hiller, Moscheles, and his own favorite sister Fanny, a musician of great merit. The University of Leipzig, to which city he had removed to direct the public concerts, conferred on him the degree of doctor of philosophy, and there he organized the famous musical conservatory of Leipzig.

No composer has enjoyed more general popularity in Germany, America, and England. The list of his compositions is long. His oratorios 'Saint Paul' and 'Elijah' are sung everywhere. His 'Hymn of Praise', written in celebration of the invention of printing by Gutenberg, is known to all, as is his music to 'Midsummer Night's Dream', with its much-used 'Wedding March' and nocturne. His 'Songs Without Words' are on almost every piano. As a composer he enriched musical literature with his graceful, polished compositions, with joyous melodies, and simple rhythms and harmonies. But it was as a concert pianist and conductor that he performed what was perhaps an even greater service, for he persistently played the music of Bach, and his devotion brought the work of that neglected genius to universal attention.

At the time of Mendelssohn's death, the city of Leipzig mourned as though a king had died.

**MENSURATION.** That branch of applied mathematics which deals with lengths, areas, and volumes we call *mensuration*. (Latin *mensura*, measure.) By the use of the tables and formulas of mensuration we may determine the area of a tract of land, the mass of a pyramid, or the weight of water in a large tank. We may find the cost of painting the outside of a large silo, the number of bricks required to build a wall, the amount of gravel needed to surface a road. Surveyors, engineers, and builders are continually confronted with problems in mensuration.

#### Linear Measure

In measuring distances, and working problems dependent on distances, linear measure is used.

12 inches (in.)	= 1 foot (ft.)
3 feet	= 1 yard (yd.)
16½ feet	= 1 rod (rd.)
320 rods	= 1 mile (mi.)
5280 feet	= 1 mile

Problem: How many feet of wire are needed to make a fence 6 wires high around a field 30 rds. long and 20 rds. wide?

Solution:  $2(20+30) \times 16.5 \times 6 = \text{length of wire.}$

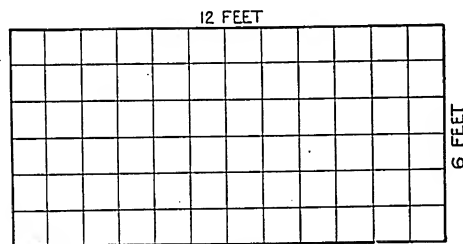


Fig. 1

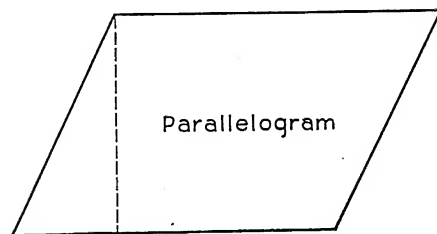


Fig. 2

Problem: How many trees can be set, 20 ft. apart each way, in a field 40 rds. long and 200 yds. wide?

Solution:  $\frac{40 \times 16.5}{20} \times \frac{200 \times 3}{20} = \text{number of trees.}$

#### Surface Measure

Plane surfaces (like a floor) are measured by finding the number of square units each contains, according to this table:

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet	= 1 square yard (sq. yd.)
30½ square yards	= 1 square rod (sq. rd.)
160 square rods	= 1 acre (A.)
640 acres	= 1 square mile (sq. mi.)

Problem: Find the area of a rug 12 ft. long and 6 ft. wide. Look at Fig. 1; how many square feet are there in the upper row? How many rows are there? How many square feet in the six rows?

Solution:  $6 \times 12 \text{ sq. ft.} = 72 \text{ sq. ft.}$ , the area of the rug. We see therefore that to find the area of a rectangular surface we must multiply the length by the width:  $\text{area} = l. \times w.$

Problem: The area of a floor is 192 sq. ft.; one side is 12 ft. Find the other side.

Solution: Divide the area by the given side, thus:  $192 \div 12 = 16 \text{ ft.}$ , the other side.

A practical application of surface measure is seen in this problem: What will it cost to make a concrete driveway 6 ft. wide and 150 ft. long, at \$2.50 a sq. yd.?

Solution:  $\frac{6 \times 150 \times 2.50}{3 \times 3} = \text{cost of driveway.}$

The area of the driveway is 6 times 150 sq. ft., or 900 sq. ft.; divide by 9 to change to square yards. The area is 100 sq. yds. The cost is 100 times \$2.50, or \$250.

A parallelogram like Fig. 2 the width is not the side, but the dotted line, which is called the *height* or *altitude* (alt.). The formula for finding the area of a parallelogram is:  $\text{area} = \text{base} \times \text{alt.}$

A trapezoid, Fig. 3, has two sides parallel. Its area

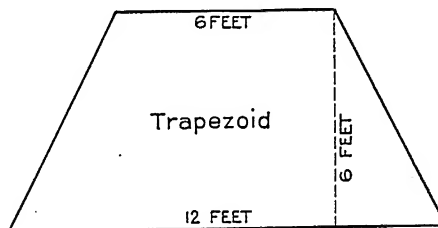


Fig. 3

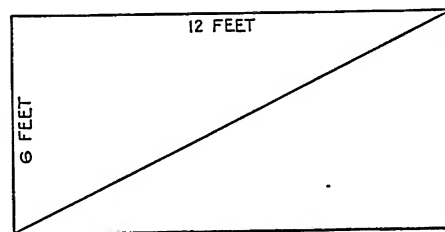


Fig. 4

is the product of its altitude and the mean (or average) of the two bases.

Problem: Find the area of a trapezoid whose bases are 12 ft. and 6 ft. and altitude 6 ft.

Solution:  $\frac{12+6}{2} \times 6 = 54$ . The formula for finding the area of a trapezoid is:  $\text{area} = \frac{1}{2} \text{ sum of bases} \times \text{alt.}$

#### Triangles

We see that the rectangle (parallelogram), Fig. 4, is divided into two equal triangles. The area of the rectangle is  $6 \times 12$ , or 72 sq. ft. The area of each triangle is  $\frac{1}{2}$  of 72 sq. ft., or 36 sq. ft. The formula for finding the area of a triangle is:  $\text{area} = \frac{1}{2} \text{ base} \times \text{alt.}$

#### The Circle

The circumference (C) of a circle is about three times the diameter (D). To be more exact it is 3.1416



times the diameter. The usual symbol for the number 3.1416 is the Greek letter  $\pi$  (or  $\pi$ ). The formula for the diameter of a circle is  $C = \pi \times D$ . Conversely  $D = C \div \pi$ . A tree whose circumference is  $8\frac{1}{2}$  ft. has a diameter of  $8.5 \div 3.1416$ , or 2.7056 ft.

Finding the area of a circle: We may think of a circle as made up of a number of triangles which may be cut apart and then fitted together as in Fig 5. If we take triangles enough, we shall have almost a parallelogram, with one half of the circle's circumference for base and its radius for altitude, and equal in area to the circle. Pushing this to the limit, to "flatten" the base, we can consider the result exact. The area then is  $\frac{1}{2}C \times R$ . But  $\frac{1}{2}C = \frac{1}{2} \times 2\pi R$ , so the area  $= \pi R^2$ .

Problem: A horse tethered by a rope 100 ft. long can graze over how much ground?

Solution: 100 ft. is the radius of the circle over which the horse can graze. The area of this circle equals  $\pi$  multiplied by the radius squared:  $3.1416 \times 100 \times 100 = 31,416$  sq. ft.

#### Volumes

To find the volume, or cubic content, of a rectangular solid: In the rectangular prism represented by Fig. 6 we see that there are 5 layers, and each layer consists of 12 small cubes (4 times 3 cu. ft.); in the five layers there are 5 times 12 cu. ft., or 60 cu. ft.

Problem: What will it cost to make the excavation for a basement 45 ft. long, 30 ft. wide, and 7 ft. deep, at \$1.25 a cu. yd.?

Solution: The volume of the earth removed is  $45 \times 30 \times 7$ , or 9,450 cu. ft. This, divided by 27 cu. ft., equals 350 cu. yds. The cost is 350 times \$1.25, or \$437.50.

$$\frac{45 \times 30 \times 7}{3 \times 3 \times 3} \times \$1.25 = \$437.50.$$

#### Cylinders

We can see that the volume of a cylinder (Fig. 7) is equal to the area of the base times the altitude, or height, remembering that the base of the cylinder is a circle.

Problem: Find amount of water held in a cylindrical tank with a diameter of 6 ft. and a length of 12 ft.

Solution:  $\pi$  times the square of the radius (3 ft.) equals the area of the base; 12 times the area equals the volume, or the quantity of water the tank contains.  $3.1416 \times 3 \times 3 \times 12 = 339.2928$  cu. ft.

We may wish to paint a cylinder. Its total surface

consists of two circles and the equivalent of a rectangle (the lateral surface unrolled).

Problem: Find the cost of painting the outside of a cylinder 15 ft. high and 8 ft. in diameter, at 2 cents a sq. ft.

Solution:  $2(3.1416 \times 4 \times 4) + (3.1416 \times 8) \times 15 \times \$0.02 = \text{cost}$ . The area of each base (circle) is  $\pi(3.1416)$  times the radius (4) squared, or 50.2656 sq. ft.; the two bases, 100.5312 sq. ft. The circumference of the base ( $\pi \times D$ ) is  $3.1416 \times 8$  ft., or 25.1328 ft. Multiplying this by the height (15) gives us the area of the side surface of the cylinder, or 376.992 sq. ft. Adding this to the area of the two bases, we have the total surface, 477.5232 sq. ft. Multiplying \$0.02 by this number gives the cost of painting, \$9.55.

#### Pyramids and Cones

A pyramid is a solid whose base is a polygon (figure bounded by three or more straight lines) and whose sides are triangles meeting at a point called the vertex. Suppose we build around a pyramid five others exactly like it to form a cube (Fig. 8). The pyramid, as we see, has  $\frac{1}{6}$  the volume of the cube. The volume of the cube is the area of its base times twice the height of the pyramid. Thus the volume of the pyramid is  $\frac{1}{6}$  the area of its base times twice its height, or  $\frac{1}{3}$  the area of its base times its height.

Problem: Find the volume of a pyramid 5 ft. square at the base and 12 ft. high. Solution:  $\frac{1}{3}(5 \times 5 \times 12) = 100$  cu. ft.

Find the area of the sides (convex surface) of a pyramid 8 ft. square at the base, and having a slant height of 10 ft. Each of the four sides is a triangle, its area is  $\frac{1}{2}(\text{base} \times \text{alt.})$ ; but the altitude of each side is the slant height of the pyramid. Hence, the area of all sides (convex surface) equals  $\frac{1}{2}$  the slant height times the perimeter (the sum of the sides) of the base.  $\frac{1}{2}(4 \times 8 \times 10) = \text{area of convex surface} = 160$  sq. ft.

A cone is a solid having a circle for a base and tapering uniformly to a vertex. Think of this as being

a pyramid with an infinite number of sides to its base. Obviously then the volume of a cone will equal  $\frac{1}{3}$  the area of the base times the height.

Problem: How much earth is needed for a conical mound 42 ft. in diameter at the base and 12 ft. high?

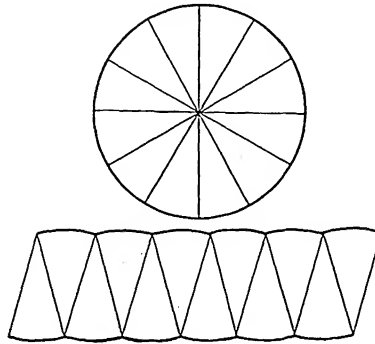


Fig. 5

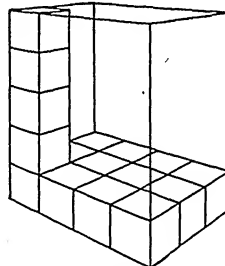


Fig. 6

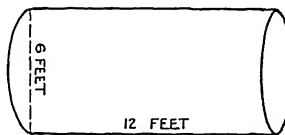


Fig. 7

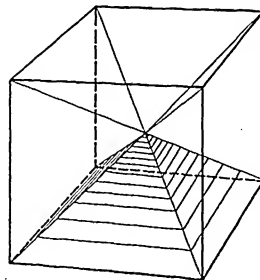


Fig. 8

Solution:  $\frac{1}{3}(3.1416 \times 21 \times 21) \times 12 = 5541.7824$  cu. ft. We multiply  $\pi$  by the radius (21) squared, multiply that result by 12, and find  $\frac{1}{3}$  of this result.

We considered the surface of a circle to be made up of a large number of triangles. Similarly, we may think of the convex surface of a cone as made up of small figures that are practically triangles. Hence, the area of the convex surface of a cone is equal to  $\frac{1}{2}$  the slant height of the cone (which is the altitude or height of each triangle) times the perimeter of the base (a circle).

Problem: Find the area of the convex surface of a cone which has a slant height of 10 ft. and a diameter at the base of 12 ft.

Solution:  $\frac{1}{2}(3.1416 \times 12) \times 10$  sq. ft. = 188.496 sq. ft.

#### Frustums and Prismoids

Suppose a pyramid or cone is cut through in a plane parallel to its base. The remainder below is known as the frustum of the pyramid or cone. Let us elaborate the frustum of a pyramid into the form of a solid with base and top formed by parallel polygons, and whose sides are therefore triangles or quadrilaterals. Such a solid is called a prismoid and the term includes among other things pyramids and frustums of pyramids. The formula for finding the volume of a prismoid is of the greatest importance, since it holds true in many instances when the sides of the prismoid have become curved surfaces, as in a sphere, cylinder, cone, or the frustum of a cone, and it can be used to find the volume of many irregular objects.

To find the volume of a prismoid: Ascertain the area of the base and top surface, let us call them A and a respectively. Call the area of the midsection M, which is the area of the plane midway between, and parallel to the base and top. Call the height H.

$$\text{Then the volume} = \frac{H(A + a + 4M)}{6}$$

#### Capacity

Volume measurements may be used to find capacity of a bin (bu.) or a tank (gal.) and to determine the weight of materials.

Problem: Find the number of bushels of grain that can be put into a bin 10 ft. long, 8 ft. wide, and 6 ft. deep, allowing .8 bu. to the cu. ft.

Solution:  $10 \times 8 \times 6 \times .8$  bu. = 384 bu.

Problem: Find the number of gallons of water that can be stored in a cylindrical tank 14 ft. in diameter and 11 ft. deep, allowing 231 cu. in. to the gal.

Solution:  $\frac{3.1416 \times 7 \times 7 \times 11 \times 1728}{231 \text{ cu. in.}} = 12,666.93 + \text{gals.}$

What is the weight of this water, at 62.5 lb. to the cubic foot?  $3.1416 \times 7 \times 7 \times 11 \times 62.5$  lb. equals the weight of the water in the tank, or 105,832.65 lb.

The weight of any mass is the weight of an equal volume of water times the substance's specific gravity.

Problem: Find the weight of a cylindrical section of marble 4 ft. in diameter and 6 ft. high, the specific gravity of marble being 2.688.

Solution:  $\frac{3.1416 \times 2 \times 2 \times 6 \times 62.5 \times 2.688}{2000 \text{ lbs.}}$  equals the

weight of the marble in tons. After finding the cubic contents of the marble we find the weight of an equal volume of water, then multiply by 2.688, since marble is 2.688 times as heavy as water. Reduce this to tons by dividing by 2000. Answer 6.334 + tons.

#### Spheres

Think of a sphere (or ball) cut into two hemispheres (half spheres) and resting on the flat side. The area of the curved surface of each hemisphere is just twice the area of the circular base. Hence the area of the curved surface of the whole sphere is equal to 4 times the area of this flat base of the hemisphere. This area we can find from the diameter of the sphere.

Problem: Find the area of the surface of a sphere whose diameter is 6 ft.

Solution:  $4 \times 3.1416 \times 3 \times 3 = 113.0976$  sq. ft.

We may think of a sphere as made up of a large number of pyramids whose height is the radius of the sphere, and the sum of whose bases is the surface of the sphere. Hence, the volume of the sphere is  $\frac{1}{3}$  of the area of the surface times the radius.

Problem: Find the volume of a sphere whose diameter is 8 ft.

Solution:  $\frac{1}{3}(4 \times 3.1416 \times 4 \times 4) \times 4 = 268.08$  cu. ft. We first find the area of the surface, get  $\frac{1}{3}$  of that, and multiply the result by the radius.

**MENTAL DEFICIENCY.** The study of mental deficiency, or feeble-mindedness, began about 1800 when a "wild boy" was discovered in rural France and taken to Paris to be studied by physicians. It was first thought that bad environment had made him abnormal. Scientific studies showed that his mental development had been permanently arrested and that he could not benefit by methods used in training normal children. Two physicians, J. M. G. Itard and his pupil Édouard Seguin, were roused to interest in this new field and started the world-wide movement for better understanding and better care of the mentally defective.

During the first World War, it was found that at least one recruit in every hundred was so defective as to be incapable of any useful service in the United States Army. We now know that about the same proportion of the population is unable to manage its own affairs successfully. Because of their lack of intelligence these people often become delinquents, criminals, or dependents.

Mental deficiency among children is apparently more common or at least more readily detected than among adults. It is commonly agreed that about two per cent of children of school age are so mentally deficient that they cannot profit seriously from ordinary instruction. These children seldom progress beyond the fifth grade.

We may divide the feeble-minded into three groups—idiots, imbeciles, and morons. The *idiot* group includes those whose general intelligence is below the normal for three years of age. They are usually unable to feed or dress themselves or to avoid ordinary dangers, and they develop almost no command of

speech. *Imbeciles* are those whose intelligence corresponds to that of normal children between three and seven years of age. They cannot progress beyond the first or second grade of school work, though they can perform simple industrial tasks under supervision. They gain some command of language but their ideas are very limited. *Imbeciles*, like *idiots*, must usually be placed in an institution or must receive constant care at home. *Morons* have mental capacities like those of normal children between eight and twelve years of age (see *Intelligence Tests*). They may succeed in school work up to the fourth or fifth grade, but they do not show good judgment in managing their own affairs. Under unfavorable circumstances they may become wayward or delinquent.

Unfavorable heredity is the principal cause of feeble-mindedness, and is said to account for about two-thirds of all cases. The remaining one-third are victims of accidents or pathological conditions such as abnormal glandular function, birth injuries, or the after effects of serious diseases.

No measures have been found to convert the feeble-minded into normal persons except in the case of *cretins*, who are mentally and physically retarded because their thyroid glands are not doing their proper work. But much is being done to improve the lot of the feeble-minded. Beginning about 1850, nearly every state in the Union has established institutions for them, and many private institutions have been founded. All together, they care for about one-twentieth of the estimated total number of feeble-minded in the country. Under the most successful methods of training, high-grade imbeciles and morons who are of stable disposition and reasonably industrious may ultimately become adjusted to life outside the institution.

Special classes have been established for mentally deficient children in progressive school systems, though most such children are still being taught unsuccessfully in the regular grades. Research laboratories have been established for the study of feeble-mindedness and many university psychology laboratories are paying particular attention to the subject. These scientific studies have shed a great deal of light on the understanding and training of the feeble-minded. They have also contributed to our knowledge of the mental development of normal children, and have had a marked influence in modifying methods of education.

**MENTAL HYGIENE.** We have long known that the laws of physical hygiene must be observed if the human body is to play its part well. Only recently, however, have we learned that there is a hygiene of the mind as well as of the body; that we can so direct our emotions and so adjust ourselves to our ever-changing environments as to make our lives happier and more useful.

The chief aim of mental hygiene is to preserve and develop mental health. It deals with such aspects of life as envy and worry and anger and discouragement,

and teaches how to replace them with poise, courage, and contentment. It uses facts from any helpful source, especially those from philosophy, religion, psychology, physiology, anthropology, sociology, economics, and medicine. It organizes these facts and approaches results in an effort not only to solve problems of the individual but also to increase our knowledge and arrive at a broader understanding. Mental hygiene, then, is a science in the making; an art comparable to medicine; and a movement to stimulate interest in both the science and the art.

The practise of mental hygiene may be defined as a scientific effort to develop and preserve the state of mind in which a person does the best work of which he is capable, lives with the least possible friction with his environment, and attains the greatest happiness in all phases of his life. Every human being, old or young, constantly faces the problems of *making the most of himself* and "getting along" with teachers, playmates, parents, and other people.

Since the principles of mental hygiene are most helpful when they are applied early in life, they are being used by parents, teachers, recreation supervisors, nurses, and physicians. Only a few specialists devote all their time to the practise of mental hygiene. With the exception of the home, the school is the best place for training persons to meet life properly.

A person who is poorly adjusted to life becomes mentally, and sometimes physically, ill. Such cases should then be placed in the hands of a physician who is specially trained in that branch of medical science known as psychiatry.

The term "mental hygiene" belongs principally to the 20th century, although it was used in medical literature before 1900, and was the title of a book published by Isaac Ray in 1863. It came into general use in 1907, when it was applied to a movement to improve conditions in hospitals for patients suffering from mental disorders. This movement was started largely through the efforts of Clifford Beers, who set forth his personal experiences as a patient at such hospitals in his book 'A Mind that Found Itself'.

The Connecticut State Society for Mental Hygiene was established in 1908. Out of it grew a national organization the following year. It was named the National Committee for Mental Hygiene, at the suggestion of Dr. Adolph Meyer, who was one of the pioneers of the movement. Since then the term mental hygiene has been loosely used in medicine, psychology, education, social service, industry, and other fields for all efforts to promote mental health. This too-inclusive use of the term has led to much misunderstanding of mental hygiene and its valuable contribution to the happiness and efficiency of mankind.

**MERCERIZING.** John Mercer, an English dealer in cloth, announced in 1844 the chemical process for making cotton cloth look like silk which today perpetuates his name. The process consists in steeping the fabric, yarn, or thread in a solution of alkali



(caustic soda or caustic potash) in a cool temperature, then putting it under tension, and lastly rinsing it. The process entails a shrinkage in bulk of about one-fourth. The cotton fibers, which were originally mere flattened spiral tubes, are drawn closer and made straight and translucent, so that they present a smooth surface that reflects the light with silklike luster. In the genuine process, which is expensive, the finish will not vanish when laundered. Cotton cloth thus treated is softer and stronger, and takes more brilliant colors in dyeing. Sometimes a variation in the caustic soda process is employed to give the modern crimped or crêpe effects.

'MERCHANT OF VENICE'. In this comedy Shakespeare portrays the magnificent womanhood of Portia against the dark, malignant power of Shylock, the Jew. Bassanio, soldier and scholar, and the "best deserving of a fair lady"; Gratiano, the madcap wit in his following; Jessica, that "most beautiful pagan, most sweet Jew," daughter of Shylock; and the "merchant of Venice" himself—Antonio "the kindest man"—form a galaxy of stars in this enthralling play. It contains, also, some of the greatest passages of Shakespeare's dramatic writing. One of these is Shylock's savage arraignment of his persecutors:

Hath not a Jew eyes? Hath not a Jew hands, organs, dimensions, senses, affections, passions? Fed with the same food, hurt with the same weapons, subject to the same diseases, healed by the same means, warmed and cooled by the same winter and summer, as a Christian is? If you prick us, do we not bleed? If you tickle us, do we not laugh? If you poison us, do we not die? And if you wrong us, shall we not revenge?

Another passage is Portia's matchless lines in reply to Shylock:

The quality of mercy is not strained,  
It droppeth as the gentle rain from heaven  
Upon the place beneath: it is twice blest;  
It blesseth him that gives and him that takes:  
'Tis mightiest in the mightiest: it becomes  
The throned monarch better than his crown;  
His sceptre shows the force of temporal power,  
The attribute to awe and majesty,  
Wherein doth sit the fear and dread of kings;  
But mercy is above this sceptred sway;  
It is enthroned in the hearts of kings,  
It is an attribute of God himself;  
And earthly power doth then show likest God's  
When mercy seasons justice. Therefore, Jew,  
Though justice be thy plea, consider this,  
That, in the course of justice, none of us  
Should see salvation: we do pray for mercy;  
And that same prayer doth teach us all to render  
The deeds of mercy.

MERCIER (*mër'syā*), DESIRÉ JOSEPH, CARDINAL (1851-1926). From the beginning of the World War of 1914-18, there stood out among the inarticulate suffering people of Belgium a picturesque figure, preternaturally tall and thin, with jet-black, deep-set eyes, who wielded more power over countrymen and enemy alike than any other Belgian. His long black habit with its cardinal-red braid, the heavy gold chain and cross about his neck, the wide violet sash and black-skirted cassock, all served to emphasize the transparent whiteness of the firm face above

them—thin, scholarly, ascetic, with the expression of a man who knows what he thinks and measures what he says.

Such was Cardinal Mercier, the "Voice of Belgium," who with majestic scorn and yet superb self-control called the highest authorities of Germany to account for broken promises; who aroused the indignation of the civilized world by his "Appeal to Neutrals"; and who dared to tell his people, at a time when a German ruled in the seat of King Albert, that "the sole and lawful authority in Belgium is that of our King, of our Government, of the elected representatives of the nation. This authority alone has a right to our affection, our submission." "God will save Belgium, my brethren, you cannot doubt it. Nay, rather he is saving her," was the burden of his pastoral letter on Christmas of the first terrible year. Every effort was made by the Germans to prevent his words from being heard, but these efforts were unavailing. He remained the central figure of patriotic resistance in Belgium.

Even before the war the Cardinal was a most prominent figure. He was of Franco-Belgian origin, born in a quiet hamlet near the battlefield of Waterloo on Nov. 21, 1851. As a professor of philosophy in the University of Louvain, he was known as the author of many important works on philosophy and psychology, and his science and talent were so highly appreciated that when the Archbishopric of Malines became vacant in 1906 the pope called upon Professor Mercier to fill it. A year later he was created cardinal.

Few foreign visitors have received such a warm welcome as did Cardinal Mercier when he visited America at the close of the World War. All classes paid the tribute due to one of the gentlest and most heroic figures of four years of war and oppression.

MERCURY. This is the only metallic element that is fluid at common temperatures. It is from this fact that it receives its common name "quicksilver," meaning "live" or fluid silver. The name "mercury" is given it from the fleet-footed Roman god Mercury.

Pour a little of this silvery metal on a piece of paper and notice that it does not spread like water, but forms a flattened ball, which will form still smaller balls if broken up. It is very cohesive and dense, being about 13½ times as heavy as water.

Mercury has been known since early times. Its brilliance, great weight, and unusual quality of being a liquid metal attracted medieval alchemists, who used it in their attempts to transmute base metals into gold. Physicians used it as a medicine.

Some free mercury is found, but it occurs chiefly in the ore called cinnabar, a bright red mercuric sulphide. It is easily separated by heating the ores in retorts and condensing the vaporized mercury. The world's chief mine, the Almadén in Spain, dates from 800 B.C. Italy and Spain have produced in recent years about 80 per cent of the world's output. Next in production is the United States, followed by Russia, Mexico, China, Bolivia, and Germany. The United

States usually imports more than half of the mercury it uses. California, Oregon, and Nevada account for 75 per cent of the United States production. Washington, Texas, Arizona, Arkansas, and Alaska are other producing regions.

Mercury freezes at 38° below zero (Fahrenheit) and boils at 674°; its great range between these two points and its uniform expansion under heat make it useful in thermometers and barometers, and in many scientific instruments. Its high boiling point makes it of value in a new type of power plant (*see* Steam Engine). It is used in compensating clock pendulums, heat-control devices, gas pressure and tank gauges, for flow meters, and many automatic control instruments. As it is a good conductor of electricity, and liquid as well, it is used for making contacts in thermostats and for power control switches. Mercury vapor is used in electric lamps of the ultra-violet ray type, and in rectifiers and oscillators.

Other industrial uses are found for mercury in the manufacture of fulminates used in cartridges, in solders, in making pigments such as vermilion red (called "English mercury"), in fireworks, for wood preservatives, boiler compounds, and anti-fouling marine paints, and in some of the processes of manufacturing felt, glacial acetic acid, and caustic soda.

Mercury penetrates many metals merely by contact, forming alloys with them called amalgams, a property which was formerly much used in the extraction of gold and silver from ores. An alloy of mercury with tin is used to silver mirrors, while dentists use a silver amalgam for fillings.

Drugs and chemicals account for almost 40 per cent of the total consumption of mercury. A familiar preparation is calomel (mercurous chloride,  $\text{HgCl}$ ), which should not be confused with corrosive sublimate (mercuric chloride or bichloride of mercury,  $\text{HgCl}_2$ ), a deadly poison used as an antiseptic. Mercurochrome, a complex dye containing mercury, is also an antiseptic. There are about 1,000 uses for mercury.

Mercury is shipped and sold in 76-pound flasks. The consumption in the United States in an average year amounts to about 23,000 flasks.

**MERMAIDS.** In ancient and medieval legends the mermaid was represented as a woman with a human head and body ending in the scaly tail of a fish. Many stories were told of mermaids enticing human lovers to the depths of the sea. Mermen, the male counterparts of mermaids, played a less important part in legend.

**MESOPOTAMIA.** Two great rivers, the Tigris and the Euphrates, are the heroes in the story of Mesopotamia, where legend locates the Garden of Eden. Its very name means the land between the rivers, and these powerful muddy streams have played an important part in its destiny since that far distant time when they began building up the alluvial plain whose rich acres push back the waters of the Persian Gulf.

So fertile is this river basin that the barbarian nomads roaming with their herds over the pasture lands of the Arabian Desert on the west or the uplands of what is now Persia and Turkey on the east and north looked upon it with unending desire. Successive tribes swept down into it and fought for its possession at the beginning of history, founding their nations and falling in turn before more powerful foes. (*See* Babylonian and Assyria.)

Archeologists have found on the Plain of Shinar, at the south of the old basin, remains going back as far as 5000 B.C. In that era the Sumerians, a non-Semitic people from the east, quitted their wandering tent-living existence and settled here to till the soil, build houses, construct irrigation systems, form governments, and create a civilization—perhaps the first in the world (*see* Civilization).

These Sumerians, whose cuneiform writing on clay tablets preserved their history, made great strides in the centuries they tilled this land. Their cities—Eridu, Lagash,

Ur, Uruk, Larsa, and Nippur—flourished long before the dawn of history. Each of the strong Semitic desert tribes that conquered Mesopotamia during the next 2,000 years absorbed the Sumerian civilization and added to its luster as they brought under their rule the whole of the fertile crescent that circles the desert. The Akkadians excelled in sculpture. The first Babylonian Empire advanced commerce and banking, and handed the arch down to the great builders of the Assyrian Empire, whose first iron-equipped legions swept the crescent. Kish, and then Babylon, became great capitals, and fell as Assur and Nineveh gained in power. Nineveh left us the first known library. Babylon rose again after Assyria had destroyed it, rebuilt upon a grander scale by the Chaldean emperor Nebuchadnezzar (*see* Babylon).

About 600 B.C., the Indo-European peoples from the northern grasslands, who later conquered and settled all Europe, started to drive the Semites from this prized territory. The Medes first took Assyria, then fell before Cyrus the Great, as the Persians

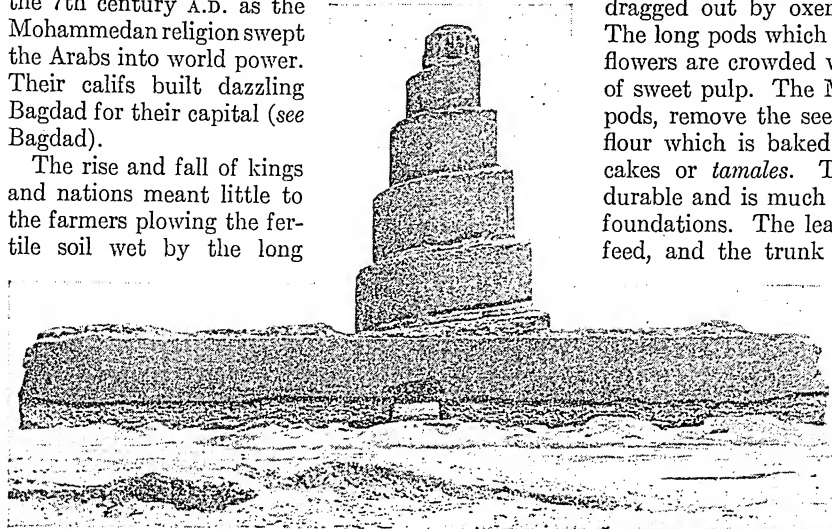
THE OLDEST FOOTPRINT IN THE WORLD



Over 4,000 years ago someone's bare foot left this imprint in a soft clay brick in the city of Ur, noted ancient city in Mesopotamia.

spread their empire to the Mediterranean, entering Babylon in 539 B.C. Alexander the Great died at Babylon in 323 B.C. after adding this land to his many conquests. Then Roman legions trampled the soil, but gave way in 363 A.D. before Persia, whose Sassanid kings established their capital at Ctesiphon. Finally a Semite people took Mesopotamia again in the 7th century A.D. as the Mohammedan religion swept the Arabs into world power. Their califs built dazzling Bagdad for their capital (see Bagdad).

The rise and fall of kings and nations meant little to the farmers plowing the fertile soil wet by the long



irrigation canals from the two rivers. Their rich crops paid for palaces and temples and armies, but the busy people cared little who ruled so long as the water flowed freely. The Mongol invasions began in the 13th century. Timur Leng's raid in 1393 almost depopulated Bagdad. Mongol hordes pouring in from the east destroyed the precious canals as they ravaged far and wide. The country did not pass completely into the power of the Ottoman Turks until 1638, but Mesopotamia never regained its ancient fertility, wealth, and splendor. The ruinous rule of the Ottomans lasted from 1638 until the end of the first World War, when a new nation, Iraq, was formed and Emir Faisal declared king (see Iraq).

**MESQUITE** (*mēs-kēl'*, Spanish *mēs-kē'tē*). In the spring and summer on the arid plains of southwestern United States the bright green foliage and the abundant fragrant flowers of the mesquite tree, or honey locust, give life and beauty to what would otherwise be dreary wastes, for it flourishes in regions too dry for any other woody plant. This it is able to do because its roots can descend great depths to find a supply of water.

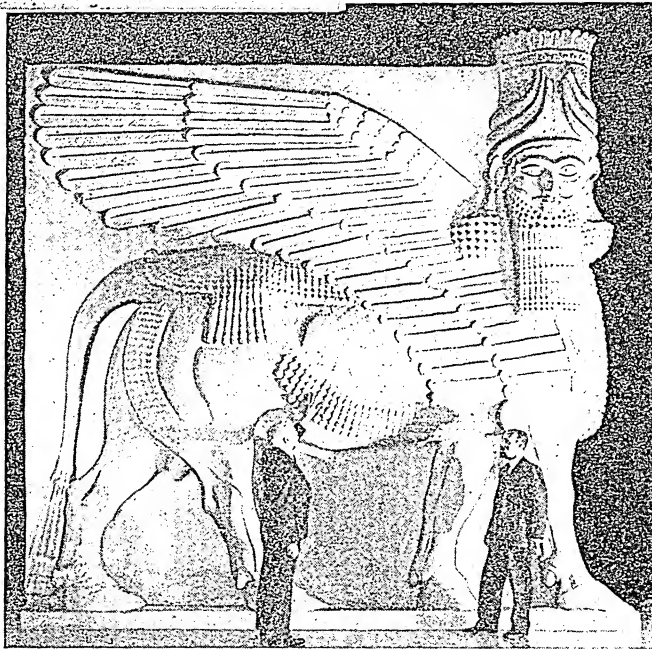
Its size shows where water can be found. If it is a shapely tree of ordinary height, water will be found within 40 to 50 feet of the surface of the ground; if it is only a lofty bush, the water will be deeper, from 50 to 60 feet, and if the stems extend up only about 3 feet above the ground, then the

water is more than 60 feet below the surface, and the plant has had to devote all its strength to the building of roots.

The remarkable root of the mesquite is an important source of fuel in arid regions. The main or tap roots do not branch or grow much smaller until water is reached, so they can be dug from the ground or dragged out by oxen in pieces 15 to 20 feet long. The long pods which succeed the tiny greenish-white flowers are crowded with seeds set in a spongy layer of sweet pulp. The Mexicans and Indians dry these pods, remove the seeds, and grind them into coarse flour which is baked into nourishing and palatable cakes or *tamales*. The heavy hard wood is very durable and is much used for fence posts and house foundations. The leaves and pods make good stock feed, and the trunk yields two kinds of gum, one

clear, like gum arabic, used in laundries and for mucilage and confectionery, and the other black, furnishing a useful dyestuff. The screw-pod mesquite is an allied species.

Scientific name, *Prosopis juliflora*. The mesquite ranges from southern Colorado southward



The ruins of the ancient Tower of Samarra (above) on the Tigris River, near Bagdad. Natives believe it to be the Tower of Babel. However, that tower stood in Babylon and was destroyed long since. Below is a winged Assyrian bull that once guarded the palace of Sargon II at Khorsabad. It is 16 feet high and weighs 40 tons, and is now in the Oriental Institute at the University of Chicago, through the efforts of Dr. James H. Breasted (left).

through Mexico as far as Chile and southern Brazil. The growth of the stem is very slow. Trunks more than one foot in diameter are probably more than 100 years old. The name mesquite is also applied to various coarse low-growing tufted grasses of the West and Southwest.



**METALS.** About three-fourths of the 92 elements are classified as metals (*see Chemistry*). To the chemist, an element is a metal if its oxide forms a base with water, as do sodium and iron; and a non-metal if its oxide forms an acid with water, as do sulphur and phosphorus (*see Acids and Alkalies*). Yet the line cannot be sharply drawn between metals and non-metals, for some elements, like arsenic and antimony, have properties characteristic of both.

Ordinarily we think of metals as having certain properties, such as weight, hardness, malleability, ductility, and as having a crystalline structure capable of taking a polish, and as being good conductors of heat and electricity. But not all metals have these properties. Mercury is a liquid; antimony and bismuth are brittle; sodium and potassium are extremely soft; lithium weighs little more than half as much as water. Metals vary greatly in their melting points, from mercury, which melts from the frozen state to a liquid at 38° below zero F., to tungsten, which is believed to melt at about 5,900° F. They also vary in chemical activity: some metals, like potassium and sodium, combine vigorously with even cold water; some, like gold and platinum, react only with the strongest and most active chemical agents.

Many metals have properties in the pure state that are undesirable to man, and as a consequence most of the metals we see in common use are either alloys or compounds (*see table with Alloys*). Table silver, gold coins, aluminum pans, the metals of tools and machinery, of skyscrapers and locomotives, are alloys. Pure iron, for example, is too soft to be of much value; so it is used most frequently as steel, a compound. Small quantities of metals such as chromium are sometimes alloyed with steel for hardness.

Some metals are found in the pure state, but by far the greater part of them are in combination with other elements in the form of sulphides, oxides, carbonates, and silicates, usually mixed with rock and earthy materials (*see Minerals*). Lead, zinc, iron, copper, chromium, nickel, and mercury, are among the common metals found in combination in ores. Some metals are quite rare, and tons of ore must be treated to recover even a small amount of the pure metal. Among the rare metals are rubidium, titanium, cesium, and radium. The latter, one of the most expensive, belongs to the same chemical family as calcium, one of the commonest of all elements.

The recovery of metals from their ores is the science of *metallurgy*, involving many mechanical and chemical processes. Metal-bearing portions of the earthy material are first separated by various *ore-dressing* processes—grinding, sifting, and washing—the heavier particles sinking to the bottom, while the mud and rock are washed away.

#### Methods Used in Metallurgy

The *froth flotation* process is important in concentrating ores, especially sulphides of copper, lead, and zinc. It can be used to separate finely divided metallic gold. The finely ground ore is mixed with water and

an oily material, and then air is blown through the mixture, forming a thick froth on the surface, to which cling the oily, fine particles of metal. If the ore is a sulphide, the concentrate thus obtained is roasted, changing the metal to an oxide as the sulphur burns out and changes into sulphur dioxide. The oxides of the metal thus obtained are more readily reduced to metallic form.

Zinc ores are roasted, leached with water and then with sulphuric

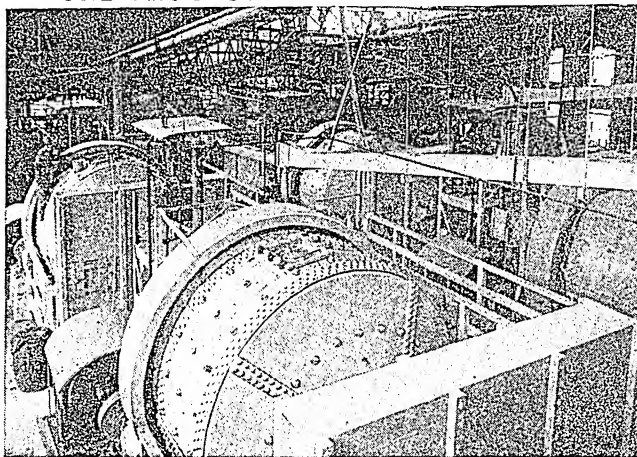
acid which dissolves the zinc and precipitates lead and other metals that may be present. The pure zinc is then separated by electrolysis (*see Electrochemistry*), which produces pure metal.

Gold and silver are sometimes removed from finely ground ores by using mercury, which takes the metal from the ore in an amalgam; sometimes they are dissolved by cyanides. Silver is sometimes separated from gold electrically, and by passing chlorine gas through a melted mixture of the two, separating the silver as a chloride. They are also purified by the *cupellation* process, in which they are heated in cupels, or porous clay cups, the impurities being oxidized and absorbed. Finely divided zinc is used in some methods of refining gold and silver by precipitation.

Aluminum is produced by electrolysis of molten mixtures of aluminum salts (*see Aluminum*), a method applicable to magnesium and beryllium, two light metals not yet in general use. The alkali metals and alkaline earth metals can be recovered by electrolysis of their hydroxides (*see Alkali Metals and Alkaline Earth Metals*).

The commonest ores of iron are oxides and carbonates, and are treated by heating in a blast furnace, with a flux, usually of limestone, to reduce the fusion temperature and to aid slag formation with the silica present, and with coke to take up oxygen. If sulphides

#### ONE PROCESS IN REFINING COPPER



Ball mills, like those shown above, are used to pulverize certain ores. Thousands of steel balls are tumbled about in the revolving cylinders and grind the ore to the desired fineness.

are present, the ore may first be roasted. (*See Iron and Steel.*)

Metallic ores make up the greater part of the inorganic world, such as clays, which contain aluminum, iron, magnesium, and calcium; limestones, containing calcium and magnesium; and many other minerals containing iron, copper, zinc, and lead.

Few metals are necessary to either plant or animal life. The important exceptions are iron, a constituent of blood; calcium, which as a phosphate forms the greater part of the bony structure; sodium, potassium, and magnesium. Of secondary importance to life are copper, aluminum, and manganese. Minute quantities of them are found in the average balanced diet.

## The WORK of SMITHS of Many AGES and COUNTRIES

**METAL WORKING.** Many thousands of years ago men pierced bits of gold for beads or hammered them into crude ornaments—probably the first use of the first metal known. Much later, but still so long ago that we cannot date it, copper was discovered and became of great use. Even today these two metals may typify the extremes of achievement in metal working—the delicate and decorative use of gold in the arts, and the severely practical use of copper in the industries of this electrical age.

Copper ushered in the Age of Metal, the beginning of a long and amazing development that has given us thousands of products, the steel framework of our skyscrapers, our locomotives, automobiles, and airplanes, and innumerable machines to make the world's goods in quantities.

Both utensils and weapons were made of copper, and when it was discovered, probably by accident, that the admixture of tin formed a hard bronze, metal working was given an impetus that has lasted until today. Bronze made excellent castings, and was used by the Assyrians, Egyptians, Cretans, Greeks, and Romans for statues and ornaments, as well as for commoner articles. Museums show an astonishing array of Bronze Age relics—chisels, ax and spear heads, decorated swords and daggers, ornamented vases and bowls, shields, and later dated mirrors, chairs, tables, statues, and portrait busts (*see Bronze*).

In later European times, metal workers produced such works of art as the tomb of Maximilian I in

Vienna, with its 28 bronze statues, executed by Peter Vischer of Nuremberg; or the colossal Perseus in Florence, by Benvenuto Cellini. Ponderous church doors, great bells, candlesticks, crucifixes, shrines, altars, fonts, inkstands, door knockers, hinges, and handles were cast in bronze and worked by artists of note. Cellini, Lorenzo Ghiberti, and Michelangelo in Italy, and Germain Pilon and Jean Goujon in France

distinguished themselves as consummate artists in metal.

Brass, an alloy of copper and zinc, was little used until the Middle Ages. Then followed brass castings and *repoussé* (relief) work. Pulpits and lecterns, often topped by eagles, pelicans, or griffins in brass, massive candlesticks, and chandeliers were made for churches. Firedogs, wall sconces, locks, and utensils were made by the brass workers (*see Copper and Brass*).

Gold and silver were used by nearly all the ancients for jewelry, coins, and vessels. Cups and jugs of the precious metals were ornamented by the Romans with scenes, figures, flowers, and conventional designs. Roman plate of later times was simpler, with border decoration chiefly.

In later times European goldsmiths produced such notable pieces as the gold cross of Justin II and Sophia in St. Peter's, Rome, the Gourdon gold chalice and paten, the chalice by Duccio of Siena, and the Cross of the Angels at Aviedo, Spain. Table service was crowded with the ornamental detail of the Renaissance, like the Cellini saltcellar made for Francis I, or of austere simplicity

ROMAN AND GREEK METAL WORK



The Greek drinking cup of bronze, at the top, was found near Delphi, and is believed to date from the 3d century B.C. Immediately below is a Roman libation bowl, made of silver, found near Backworth in England. At the bottom, left, is a Roman cup, of heavy silver, with a bold decoration of olive leaves and fruit. At the right is a Greek mirror, of bronze, engraved with figures of Aphrodite and Pan. The handle is missing. The other side was polished for reflecting.

like that of 18th-century Georgian England.

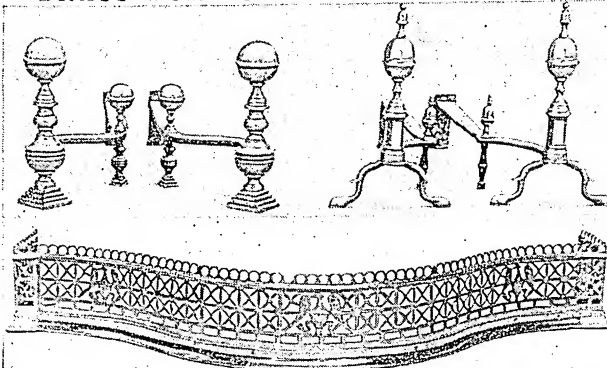
Lead was used by the Greeks for statuary; and the Romans used it for water pipes. English lead coffins showed fine artistry; and retainers' badges from feudal times are to be found in all museums. Probably the highest artistic employment of lead is in the English garden statuary and fountains. Lead has many uses because it is durable.

Pewter, originally an alloy of tin and lead, but now usually of tin, copper, and antimony, became a favorite medium. The Chinese, Chaldeans, Egyptians, and Greeks probably worked with it, and it was used by the Romans during their English occupation. Durable, and yielding to shaping, it found wide use for tableware and decorative objects as early as the 14th century. Continental workers produced many beautiful plates and vessels of pewter; but British craftsmen used it more extensively. In Elizabethan times it was common for cooking utensils, flagons, communion services, and table sets.

In colonial America, much of the tableware was of pewter, some of it brought from Europe, but most of it produced by colonial craftsmen. Little decoration except a slight engraving was used, the charm depending on strong outlines emphasizing utility. The heyday of the craft came between 1750 and 1850; of late years there has been a revival of interest in pewter. (See Alloys.)

Iron responds readily to working and artistic treatment. Iron supplanted the softer bronze for weapons, and legends grew up about swords and the great

## BRASS WORK OF COLONIAL AMERICA



These brasses are typical of the period preceding 1800 in the United States. The andirons, above, and the pierced brass fender, below, are colonial in design and execution.

smiths who made them. By the middle of the 16th century the European armorer occupied the highest place among the craftsmen, as did the Arabian armorers of four centuries before (see Damascus), and the Japanese armorer of the Samurai period. On his skill depended protection, freedom of movement, and appearance. With the Renaissance the trade began to die; graceful simplicity of

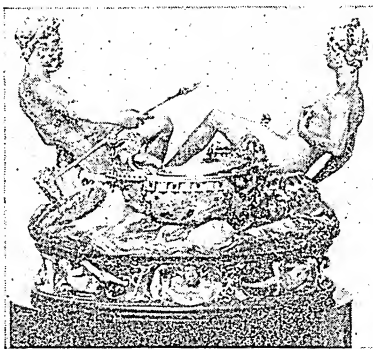
design and nicety of construction were replaced by etching, engraving, embossing, and inlay work (see Armor).

Iron had other uses besides weapons and armor. It was used by the Assyrians and Egyptians; and by

Roman times was in common use, for both practical and artistic purposes. In the Middle Ages, and later, we find firebacks, fireplace implements, ornate lanterns, escutcheons, candlesticks, and screens of intricate design. Massive doors with heavy iron mountings, hinges rich in ornamental design, intricate locks, and formidable knockers, add to the impressiveness of many historic buildings. Elaborate gates and grilles, such as that protecting the tomb of Edward IV in St. George's Chapel in Windsor, are found throughout Europe. Similar modern work is popular.

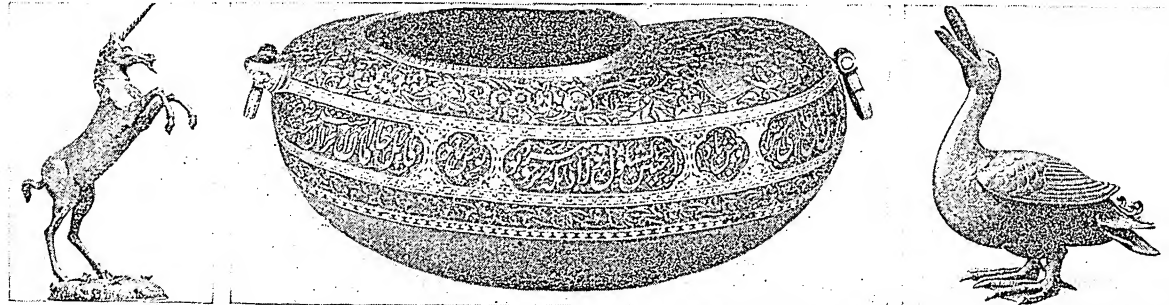
In the Orient metal work was developed with a high degree of artistry. Persian and Indian brass work is well known, and the fine tracery of damascened objects was perfected in the Orient. Unusual gold work characterizes the work of the Javanese. The Chinese produced brass and bronze art, some of

## WORK OF A MASTER GOLDSMITH



This gold saltcellar was made by Benvenuto Cellini for Francis I of France, and is now in the museum at Vienna.

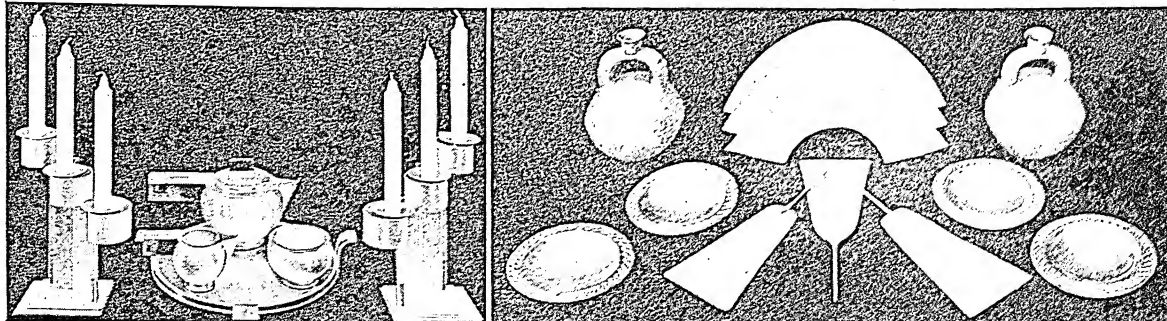
## CRAFTSMANSHIP OF DIFFERENT COUNTRIES AND AGES



At the left is a standing cup of silver, in the form of a unicorn, made in Nuremberg in the 16th century. Bizarre cups of many odd shapes were popular at that time. In the center is a beggar's bowl from Persia, made of watered steel, inlaid with gold and banded with texts. At the right is a bronze incense burner in the shape of a duck, made in Japan in the 17th century.



## WORK IN PRECIOUS METALS BY ANCIENT AND MODERN SMITHS



At the left is some modern silver, typical of a fine type of 20th-century work. At the right are gold plates and water bottles, and gold ornaments made centuries ago by Peruvian metal workers. Below are two Chinese "iron pictures."

exceptional beauty, in many different periods, now sought by collectors. Their 17th-century iron work is most unusual, pictures being made on screens with the metal, achieving lines and effects of almost unbelievable fineness and grace.

The Japanese drew upon China in many of their artistic endeavors, but many of their techniques are their own. Iron sword guards show originality of design, while many bronze articles, particularly vases, trays, and small figures are collectors' items. Artists developed colored metallic alloys for inlay purposes, and utilized such unusual methods as cloisonné (see Enameling), inlays in middle relief, and decorations in high relief, sometimes cast with the object. Today excellent work is being done in silver vases, incense burners, bowls, in strangely realistic figure groups, and in hammered work (see Japanese Art and Architecture).

In European countries ornamental metal working still holds a prominent place. Germany put a new stimulus into silverware manufacture by working out designs that take into consideration both the limitations and capabilities of machines. It thus opened the market for sternly modern silverware that is both artistic in its essential simplicity and geometric strength, and yet radically different from designs common in hand-made ware.

Germany also startled the world with tables, chairs, and other furniture of metal, and



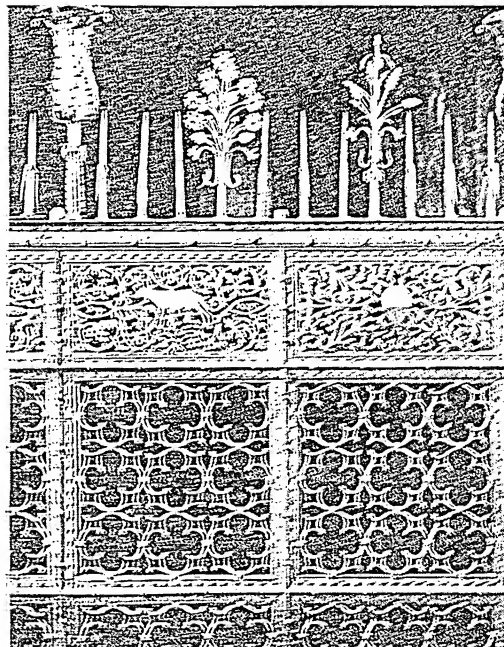
was soon joined by the United States, which now produces even larger quantities of metal furniture using aluminum tubing, bronze, chromium plating, brass, silver, and copper.

The French excel in the use of brass and copper for work of high artistic merit, such as fire screens, andirons, book ends, and mirrors. The United States has done more in striking combinations of steel with mountings of bronze, silver, and aluminum.

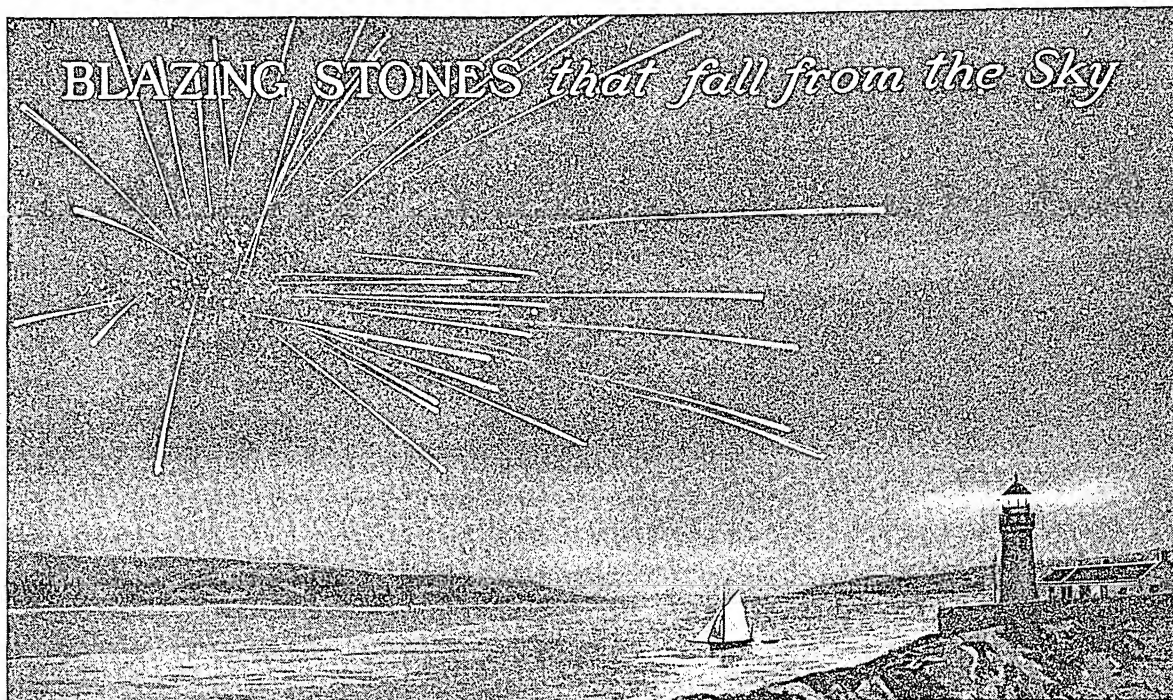
Modern metal workers in the purely commercial and practical field, such as steel workers, machinists, sheet-metal

workers, and welders, are respected craftsmen and well paid. The machinery used in the metal-working industries is complicated to a high degree. Metal is formed by drawing, extrusion, spinning, die casting, by automatic screw machinery of various kinds, as well as by modern adaptations of old methods of casting, forging, and rolling. Metals are being used to a larger extent; even houses are being constructed with metal members, like skyscrapers. One of the modern developments in the metal industries is the introduction and improvement of the lighter metals, such as aluminum and magnesium, and the adaptation of them, or their alloys, to a multiplicity of special uses. The wider use of metal in the arts, and the ever-increasing number of machines of production, provide a livelihood for more and more people.

## ORNAMENTAL GRILLE WORK OF IRON



This beautiful wrought-iron grille in the chancel of Consiglio Chapel of the Palazzo della Signoria, in Siena, Italy, was the work of Niccolò di Paolo, in 1436. It is typical of hundreds of other such pieces of craftsmanship to be found in many cities of Europe. In recent years architects have again made extensive use of hand-wrought iron, in grilles, gates, and railings.



An Artist's Drawing of a Meteoric Shower that Seems to Come from a Center Called the Radiant

**M**ETEORS AND METEORITES. When we look up into the sky on a clear night, we often see a "shooting star"—a bright object which flashes swiftly across the heavens, and disappears. What is it? Where did it come from? Where did it go?

Men have asked these questions since the earliest days; but not until modern times have the answers been known. Today, however, we know that these flashes occur when bits of matter—stones, rocks, or lumps of metal—are drawn to the earth from outer space by the force of gravity. If they overtake the earth in its orbit, they may strike with a speed of some 7 miles a second; if they collide head-on, the speed may be 49 miles a second. But at either speed the object compresses and heats the air to such an extent that the object takes fire. Usually it burns completely before it can strike the earth.

Some of these bits of matter strike the earth before they can be completely consumed. Then we can learn what they contain. We call them *meteorites*, to distinguish them from the *meteors*, which burn up in the air. We know that meteors have the same material, by examining their light with a spectroscope (*see Spectrum and Spectroscope*).

Where does the matter come from? It was thrown off from the sun when the planets were formed, or was left when various heavenly bodies broke up (*see Planets*). Most bits are so small that several thousand could be held in one hand. Perhaps 20 million specks of this *cosmic dust* enter the atmosphere every day.

Meteors often travel in swarms; and a swarm striking the air causes a brilliant display called a *meteoric shower*. Some swarms travel in regular orbits through

the solar system, and the earth meets them regularly. One such swarm, called the Leonids, is encountered every year, but only once in 33 years does the earth enter it completely enough to cause a brilliant display. This happened in 1799, 1833, and 1866; but the displays in 1899 and 1933 were slight, probably because the planet Jupiter had pulled the swarm somewhat out of its regular path.

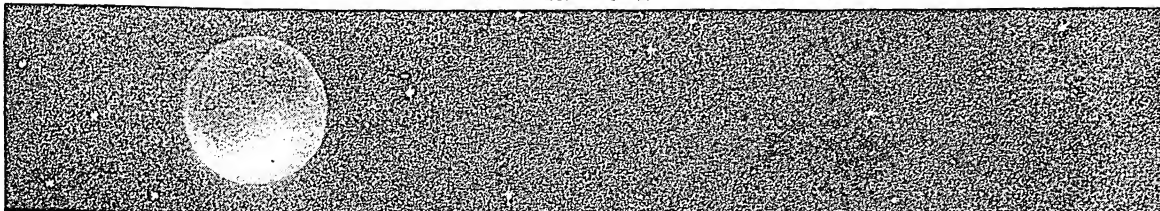
#### When Meteorites Hit the Earth

Most meteorites are small, but a few are huge. The largest one known, which fell nobody knows when, was discovered in 1929 near Grootfontein, South Africa; it weighs from 50 to 70 tons. A still larger mass fell June 30, 1908, near the Stony Tunguska River in Siberia. Prof. L. A. Kulik explored the site in 1927 and found the earth was heaved up in waves for miles, and that trees had been killed by an explosive blast for 25 miles around. This meteorite, or perhaps swarm, may have weighed 40,000 tons. An even larger mass formed Meteor Crater, near Canyon Diablo in Arizona, a crater 4,150 feet across at its widest, big enough to engulf downtown New York; 150 million tons of rock were thrown out of the hole. The amount of erosion indicates that the crater is from 2,000 to 5,000 years old. Fortunately, such huge masses seem to strike the earth only once in several centuries.

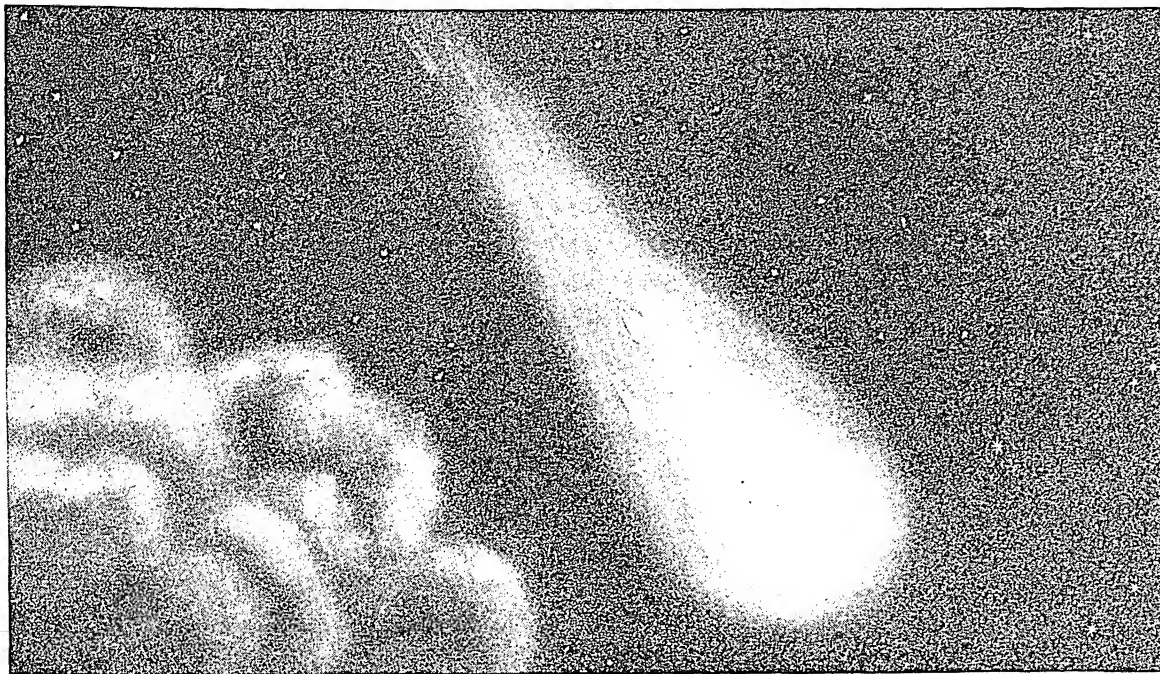
Whether large or small, all meteorites are made either of stony material, or metal, or a mixture of stone and metal. The stony ones are called *aerolites*, the metal ones *siderites*, and the mixed ones *siderolites*. The principal metal found is iron, combined with nickel and traces of copper, cobalt, and rare metals. Atmospheric gaseous elements are found, but



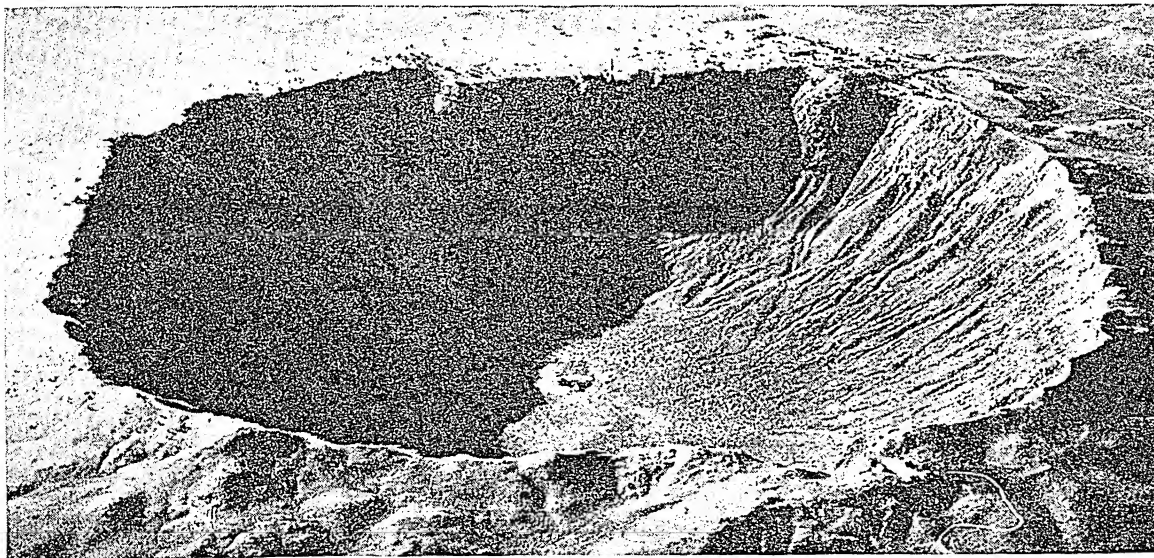
## LIFE AND DEATH OF A METEORITE



A meteor ordinarily travels quietly along in its regular orbit through space, as shown above. But when it comes near a planet such as our earth it plunges headlong toward its great neighbor. Its passage across the sky is often followed by a sound like distant thunder.



Heat caused by friction with the earth's atmosphere, which resists such terrific speed, ignites the rushing mass, so that it is seen as a streak of fire (above). But the flaming trail lasts only a few seconds, for the meteor bursts against the air pressure, or buries itself in the earth. Evidence of its fiery flight is found in the glossy black crust which identifies most meteoric fragments. This appears in sharp contrast to the usual light gray interior speckled with metallic iron.



This airplane picture gives an idea of the tremendous pit near Winslow, Ariz., which is believed to have been made by a meteorite. Meteor Crater yawns four-fifths of a mile wide and 570 feet deep. Its slopes are strewn with pieces of crushed boulders, and meteoric iron is scattered within a five-mile radius outside. Scientists are digging for the meteorite itself, for the mass which hollowed such a bowl may contain metals worth half a billion dollars.



no new element has been discovered. One peculiarity of meteoric iron is a special kind of crystallization which is unknown on earth.

Armor plate was first made as a result of the knowledge gained through analysis of meteorite composition. In cutting up iron meteorites it was found that those having 90 per cent of iron and about 10 per cent of nickel were very hard and extremely difficult to slice. By mixing iron and nickel in the same proportions a steel was made which was harder and tougher than any known at that time.

Meteorites have caused little damage, though it is recorded that in India a man was actually killed by one of these stones from the sky. On April 26, 1803, between 2,000 and 3,000 stones fell in France in an area of less than 30 square miles. Many have been observed and picked up in the United States. Admiral Peary, the discoverer of the North Pole, transported from Greenland a huge

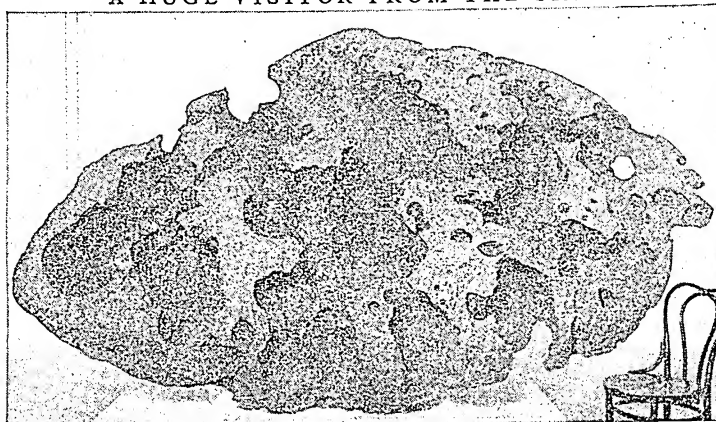
stone weighing 36½ tons which is thought by many to be a true meteorite. Only a guess can be made as to the number of meteorites which reach the earth in a year; it may be as few as 70 or as many as 3,000. So far as we know, these meteorites, fragments of

exploded worlds, may have traveled into the solar system from the outermost depths of space. In the course of their journey towards the sun, the earth strikes across their path, and what is virtually a collision occurs.

Many swarms of meteors seem to fall from a single point in the sky which is called the "radiant," and the various swarms or groups are named

for the constellation in which the radiant appears to lie. Thus we have Leonids, the Perseids, the Lyrids, and the Andromedes. The Leonids are active every year in November, but other groups appear in August, April, September, and October. Planetary attraction often changes the location of the radiants.

A HUGE VISITOR FROM THE SKIES



This tremendous mass, weighing over 15 tons, fell to earth near Willamette, Oregon. The friction of the atmosphere, setting it afire, is believed to be in part responsible for the pitting of its surface, though most of the erosion was due to the rusting away of the iron contained in the meteor as it lay in the ground after its fall. The chair beside the meteor gives you a measure of its great size.

## MACHINES that MEASURE ELECTRICITY, GAS, and WATER

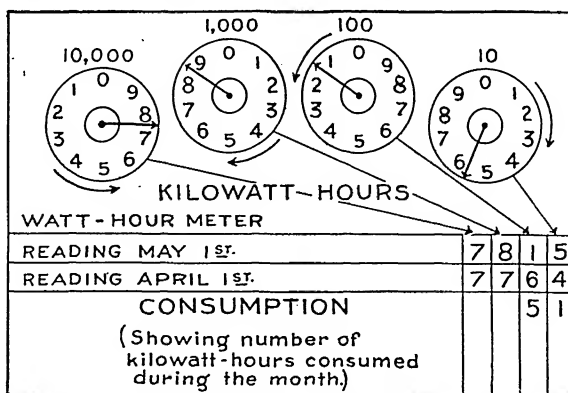
*Devices that Keep Your Accounts with the Public Service Companies—The Little Motor that Measures the Electric Current and the Bellows that Pump up the Gas Bill—Two Types of Water Meters*

**METERS.** In the basement of a city home you will usually find two, if not three, kinds of meters, which measure the quantities of gas, electricity, and sometimes water, used on the premises.

The meter in general use for measuring electric current is called a motor-meter, for it operates somewhat like a small electric motor (see Electric Generator and Motor). The current consumed passes through the meter over coils of electric magnets setting up a magnetic field of force. These forces act upon a metal cylinder or disk that is free to rotate on a pivot turning

a tiny shaft, just as the shaft of an electric motor is operated by similar magnetic forces. The more current used the faster it turns, so the number of its

revolutions indicated on the dials measures the amount of current passed through the meter. The cylinder is pivoted on a sapphire or diamond jewel to reduce the friction as much as possible. The wearing of this jewel point causes the meter to run slow and most electric meters tested after long service are found to run slow rather than fast—a fact which may give the customer some satisfaction. The turning shaft operates the first disk and



To read your electric meter, look at the first dial on the right. Set down the lower of the two figures between which the arrow is pointing (if between 9 and 0, read 9). Do the same for the other dials. Subtract from this the reading on last month's bill, and you have the number of kilowatt-hours you have used.

around its dial and the second disk will move the third and so on, the disks registering in order units, tens, hundreds, and thousands of kilowatt-hours.

The gas meter has two gas-tight chambers each having a leather bellows arrangement. The disks of the bellows are connected in such a way that when one bellows expands the other contracts. The very best grade of leather must be used in making the bellows, and it must be frequently renewed, for in order to be gas-tight it must stand a pressure as high as 200 pounds. Gas for the burners is drawn, first from inside of one bellows, then the other. The valves are so arranged that gas from the mains is supplied to the chamber surrounding the bellows which is being emptied. The pressure in the chamber squeezes gas from the bellows the chamber contains into the burners as needed. Meanwhile the other bellows is expanding. This draws in gas from the surrounding chamber, which has been filled by the previous operation of the meter. When one bellows is empty the valves shift and reverse operations. Mechanism is provided whereby the shifting of the valves operates the small drive shaft to the cog-wheels of the dials, so that the number of revolutions indicates the number of times the

THE "INSIDES" OF A GAS METER

Gas from Main enters here.

To Gas Burners

C Machinery for working the Index

A.A Slide Valves

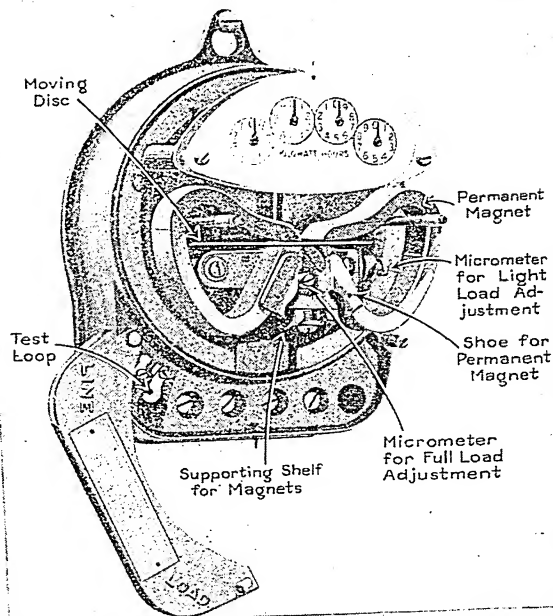
B Valve Chamber

F Outer Chamber full of Gas

E Back Bellows empty

D Front Bellows full of Gas

Gas first enters the triangular chamber (B), which is cut away to show the valves (A). The back valve (A) is open and admits gas to the back chamber (F). In this chamber is a bellows (E) with its interior connected through a valve to a pipe supplying the burners. As soon as a burner is opened, releasing gas from the bellows, the pressure in the chamber (F) forces the diaphragm of the bellows inward. As it moves in, it pushes out, by means of a connecting rod, the diaphragm of the front bellows (D), which now sucks in gas from the front chamber (G). This chamber, you must understand, has been filled by a previous stroke of the meter. When the back bellows has been emptied in the manner described, the back valve in the triangular chamber (B) closes, and the front valve opens, admitting gas into the chamber (G). This forces the front bellows inward, and so the pumping goes on like a mechanical heart. The system of rods (C) records the movements of the bellows on the dials and tells you how much gas has passed through the meter. The details shown below, are read like those of the electric meter described on the preceding page, except that the right-hand dial shows hundreds instead of units.



Here you see the mechanism which measures the amount of current your electric lights use every month. The current passes through electro-magnets (not visible in the picture) and rotates the horizontal disk just beneath the dials, and this disk turns the dials.

measure of gas in the gas-chamber has been used by the customer and the scale on the dial shows just how many 100's, 1,000's, and 10,000's of cubic feet of gas have actually passed through.

hundreds instead of units

10,000

1,000

100

WRITE DATE HERE

	READING THIS MONTH	5	3	8	0	0
5-20	READING LAST MONTH	5	2	2	0	0
4-20	DIFFERENCE		1	6	0	0
(Showing number of cubic feet of gas used during current month)						

The water supply furnished to large consumers and, in some cities, to all consumers, is measured by devices which generally operate on the same principle as the gas meter. As compartments fill and empty, a shaft is turned, and dials show the number of cubic feet of water used in a given time. Another meter, especially valuable when large quantities of water are to be measured, is known as the Venturi type. This meter makes use of the fact that in a tapering pipe the pressure changes when the velocity of flow increases. The pressure, therefore, indicates the velocity; and the velocity in turn indicates the amount of water which passes in any given time. The Venturi meter is nothing but such a constricted pipe with devices which record the changing pressures at different points. Usually the record is made in terms of hundreds or thousands of gallons.

The word "meter" (from the Greek *metron*, "measure") is also applied to the basic unit of the metric system (see Metric System).

**METRIC SYSTEM.** Americans, accustomed to the easy decimal system of dollars, dimes, and cents, would feel it a bitter hardship to be compelled to go back to British pounds, shillings, and pence. Yet in the measures of weight, length, and capacity commonly used in trade (see Weights and Measures) there are irregularities and absurdities beside which those of the British coinage are a mere nothing.

Scientific men the world over use the decimal "metric" system for weights and measures; and many countries besides France, in which it originated, have adopted it for trade and commerce and all the purposes of daily life as well. In fact, the English-speaking countries are almost the only progressive countries which have not yet adopted the metric system for all purposes.

The metric system is so simple that it has been said that a man cast on a desert island with a cubic centimeter measure (two-fifths of an inch each way) graduated in millimeters could with it reconstruct all the measures of length, capacity and weight, and measure with scientific accuracy everything on the island, from the length of a bee's wing to the height of the mountains and the area of the island itself.

The fundamental metric unit of length is the *meter*, which is a little more than a yard (39.37 inches). Dividing the meter by 10, 100, and 1,000 gives the smaller units, distinguished by the Latin prefixes *deci-*, *centi-*, and *milli-*; multiplying by the same numbers gives the larger units, distinguished by the Greek prefixes *deka-*, *hekto-*, and *kilo-*, as in this table:

10 millimeters (mm.)	=	1 centimeter (cm.)
10 centimeters	=	1 decimeter (dm.)
10 decimeters	=	1 meter (m.)
10 meters	=	1 dekameter
10 dekameters	=	1 hektometer
10 hektometers	=	1 kilometer (km.)

The units most used in actual measurements of length are the *millimeter* (about  $\frac{1}{25}$  inch), the *centimeter* (about  $\frac{2}{5}$  inch), the *meter*, and the *kilometer* (about  $\frac{5}{8}$  mile—3280.8 feet, to be exact).

In surface measure the most common unit is the *hectare* (10,000 square meters), equal to 2.471 acres.

A hollow cube measuring 10 *centimeters* on each edge would hold 1 *liter*, the basic unit of capacity in the metric system. It is about equal to 1 quart—a little more than our liquid quart and a little less than our dry quart. It is divided and multiplied to make the smaller and larger units, respectively, as is the meter:

10 milliliters (ml.)	=	1 centiliter (cl.)
10 centiliters	=	1 deciliter (dl.)
10 deciliters	=	1 liter (l.)
10 liters	=	1 dekaliter
10 dekaliters	=	1 hektoliter (hl.)
10 hektoliters	=	1 kiloliter

The cubic capacity of a liter, it will be seen, is 1,000 cubic centimeters. The liter and the *hektoliter* are the units in this table chiefly employed. Dry and liquid measures are identical in the metric system; but where the metric system is employed in commerce there is the same tendency to buy and sell by weight instead of dry measure.

One *milliliter* of pure water weighs 1 gram, the basic metric unit of weight. Multiplied and divided for larger and smaller units, it gives:

10 milligrams (mg.)	=	1 centigram (cg.)
10 centigrams	=	1 decigram (dg.)
10 decigrams	=	1 gram (g.)
10 grams	=	1 dekagram
10 dekagrams	=	1 hektogram
10 hektograms	=	1 kilogram (kg.)
10 kilograms	=	1 myriagram
10 myriagrams	=	1 quintal (q.)
10 quintals	=	1 metric ton

The *milligram* and *centigram* are chiefly used in exact scientific work. The units most used in the ordinary transactions of life are the gram, a little more than  $\frac{1}{16}$  ounce; the *kilogram*, a little more than 2 pounds (2.2046 pounds avoirdupois); the *quintal*, about 220 pounds.

When the metric system was adopted by the French National Assembly, in 1791, it was decided to take as the value of the meter the ten-millionth part of the distance on the earth's surface from the pole to the Equator. It was hoped thus to have a natural and invariable standard from which all the values of the metric system could be recovered if by accident the physical standard should be lost—as has happened to the physical standards of some other systems. The original calculation, it has been found, was subject to a slight error. The international standard meter and kilogram are made of platinum-iridium and kept at the International Bureau of Weights and Measures near Paris.

**METZ, FRANCE.** On Nov. 10, 1918, the American armies in France were preparing a blow at the German lines, which had as one of its principal objects the isolation of the strongly fortified city of Metz, in what was then German Lorraine. But the blow was never delivered, for the next day the armistice put an end to the fighting in the World War of 1914-1918. Eight days later the French entered the city. In June 1940 Metz again passed into German possession.



Metz is situated on the Moselle River and is a part of the "middle strip" which has been disputed between Germany and France almost since the days of Charlemagne. It successfully resisted a great siege by the Emperor Charles V, in 1552, and played an important part in the Napoleonic campaigns. The second famous siege of Metz occurred when Marshal Bazaine of the French army shut himself up in the city on Aug. 19, 1870, with nearly 200,000 men and remained inactive within its walls until he was compelled by lack of food to surrender to the Germans on October 27 following. At the close of the Franco-Prussian War the German general Moltke insisted that this fortress city, together with a great part of Lorraine and all Alsace, must be taken from France. France yielded, but fortified Verdun 35 miles farther west.

Next to the tremendous system of fortifications developed by the Germans, the most interesting things about Metz are its fine Gothic cathedral (founded in 1332) and the traces of its ancient Roman aqueduct. The chief industry is the manufacture of textiles. Population, about 83,000. (See Alsace-Lorraine; Franco-Prussian War.)

**MEUSE (māz) RIVER.** This historic river of western Europe figured prominently in modern wars. In 1914 the Germans took Liège, on its eastern bank; and in 1918 the Americans advanced along its western bank and captured Sedan. Again, in May 1940, the Germans swept through Liège, and were victorious in the "Battle of the Meuse" from Namur to Sedan.

Rising in northeastern France, the Meuse flows north into Belgium, where it receives at Namur its chief tributary, the Sambre, almost doubling its volume. It then flows northeast across Belgium, and enters Holland, where it is called the Maas; sweeping in a great curve around to the west it joins the Waal, an arm of the Rhine, and finally reaches the North Sea, about 20 miles below Rotterdam.

A most interesting feature of the Meuse is its disappearance beneath the ground for a distance of over three miles shortly before it enters Belgium. The Meuse is in effect, though not actually, a tributary of the Rhine. The direct distance from its source to its mouth is only 230 miles, but because of its many windings it consumes 560 miles in its course. Its larger tributaries (besides the Sambre) are the Ourthe, which pours in its waters at Liège, and the Roer, which joins it in southern Holland.

The commerce of the Meuse is probably only exceeded by that of the Rhine. A series of canals in Belgium and in Holland make it navigable for 360 miles of its course, and another canal extending to the Saone has linked it with the great river system of France.

From the ancient days when its valley was furrowed with old Roman roads leading from Gaul to southern Germany and the Danube, the banks of the Meuse have bristled with strongly fortified towns. Here during the Middle Ages was the scene of many a desperate struggle between rival princes, towns, and

social classes. A line of modern forts, built after the Franco-Prussian War of 1870-71, replaced these relics of an early civilization. Today the names St. Mihiel, Verdun, Sedan, Namur, and Liège—all lying on its banks in France or Belgium—suggest the great wartime tragedies that this river has witnessed.

**MEXICAN WAR.** "Mexico has passed the boundary of the United States, has invaded our territory and shed American blood upon American soil. War exists, and, notwithstanding all our efforts to avoid it, exists by the act of Mexico herself." So President James K. Polk said in his message to Congress in May 1846.

But many Americans as well as all Mexicans disagreed with the President then and later. The trouble grew out of a dispute over the boundary of the new state of Texas, formerly a part of Mexico. The United States claimed on somewhat doubtful grounds that the southwest boundary of the state—and therefore of the United States, since Texas had been admitted to the Union—was the Rio Grande. But Mexico claimed that it was the Nueces River some hundred miles to the eastward.

This dispute might have been settled amicably had it been the only trouble. But two other issues complicated the matter. In the first place many American citizens had claims against Mexico for losses of property caused by the unsettled condition of the country, and Mexico would not pay the claims; also the President wished during his administration to acquire the vast region of California, and in the campaign for his election the spirit of conquest had been skillfully inflamed by coupling the settlement of the Oregon question with the Mexican question. Polk had tried in vain to purchase California from Mexico, but that country had indignantly refused to sell its territory. And the refusal had added fuel to the flame, especially with those who wanted more land for the expansion of slavery. This last object, one which can easily be overemphasized as a cause of the war, was the one that aroused the opposition of the people of New England to the conflict. Their attitude was expressed by James Russell Lowell in the 'Biglow Papers'—

Ez fer the war, I go agin it—

I mean to say I kind o' du,—

Thet is, I mean that, bein' in it.

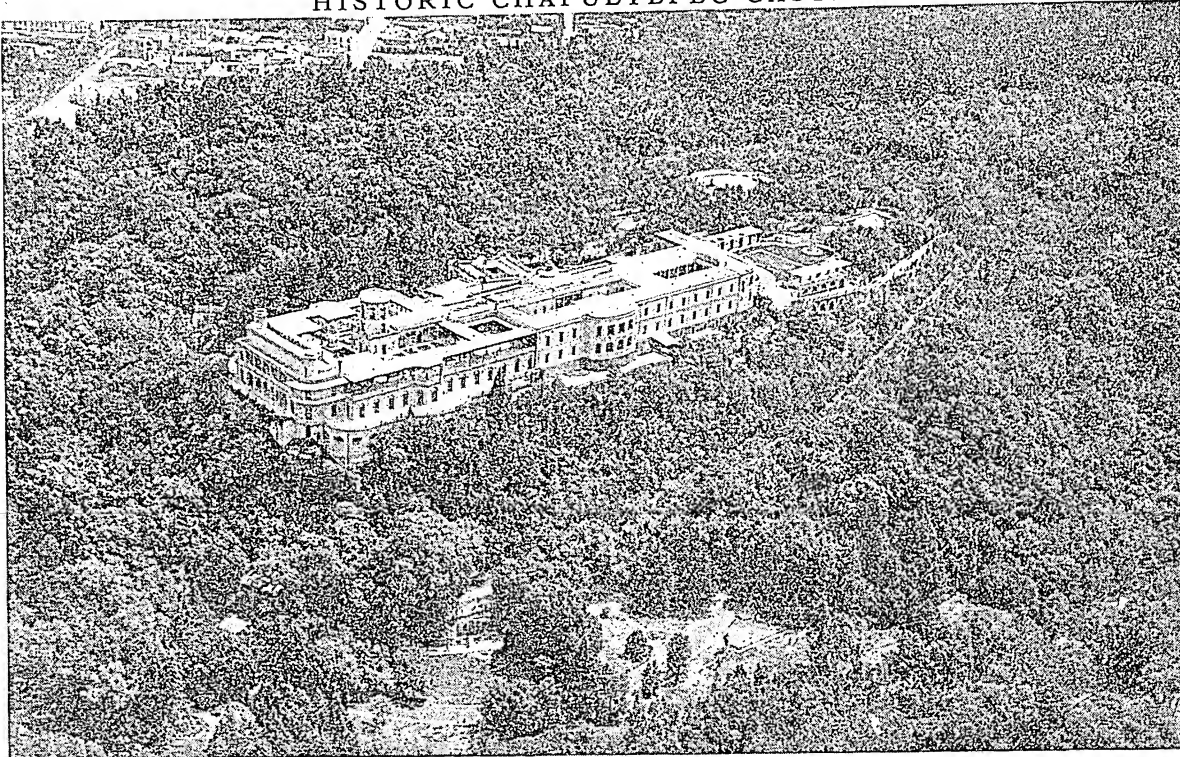
The best way wuz to fight it thru.

And so they voted men and money for carrying on the war.

#### A One-sided Conflict

In every battle in the war the American troops were victorious, though in every important engagement they were outnumbered by the Mexicans more than two to one. General Zachary Taylor with a small force was already in the disputed area when war was declared and defeated the Mexican troops at Palo Alto on May 8, 1846. Resaca de la Palma and Matamoros fell into his hands next, and then he struck boldly into the interior. After a four days' siege and a gallant resistance by the Mexicans, he entered the

## HISTORIC CHAPULTEPEC CASTLE



Chapultepec Castle was captured by United States forces in September 1847. It was then the National Military School, and many young Mexican cadets lost their lives in its defense. Long the "White House" of Mexican presidents, it is now a national museum. The magnificent cypress trees at its base were standing when the Aztec Emperor Montezuma had a summer palace here.

city of Monterrey on September 24. But his most famous victory was that of Buena Vista. There, on Feb. 23, 1847, his army of 4,700 men all day long successfully withstood the attack of 20,000 Mexicans under Santa Anna who, finally acknowledging a bitter defeat, withdrew from the field. It was a splendid victory for Taylor and one that ultimately made him president of the United States.

While these victories were being won in Mexico, Americans under Capt. John C. Fremont had taken possession of California (*see* California), and Gen. Stephen W. Kearny had secured New Mexico with practically no loss of life.

#### The Capture of Mexico City

These expeditions gained the territory that the United States wanted. But Mexico remained unyielding and so Gen. Winfield Scott was sent down to take the capital, Mexico City. On March 27, 1847, he captured the seemingly impregnable fortress on the harbor of Vera Cruz and so controlled the gateway to the country. On April 18, with 8,000 men, he drove 15,000 Mexicans from the pass of Cerro Gordo (meaning Big Hill) so precipitately that President Santa Anna left his wooden leg on the battlefield. One place after another fell into Scott's hands—Jalapa, Perote, Puebla, Contreras, Churubusco, and Molino del Rey. Finally he came to the Rock of Chapultepec (Grasshopper Hill) three miles from Mexico City. The Mexicans fought heroically in

defense of this ancient fortress. But their bravery could not make up for their poor equipment, incompetent officers, and lack of organization, and after a desperate struggle they were defeated. The next day, September 14, the American troops entered Mexico City and the fighting was at an end.

#### The Treaty of Peace

With Mexico prostrate, the demands of the American expansionists passed all bounds. Buchanan, then secretary of state, declared, "Destiny beckons us to hold and civilize Mexico." But President Polk was more moderate. By the Treaty of Guadalupe-Hidalgo (Feb. 2, 1848) Mexico accepted the Rio Grande as its boundary and in return for \$15,000,000 gave to the United States the fairest of its northern provinces—California and New Mexico, which included parts of the present states of Nevada, Utah, Arizona, Colorado, and Wyoming. Mexico was also relieved of all claims of citizens of the United States against it for loss of property. The additional territory seemed to many in the United States not an unmixed blessing, for it raised again the burning question of slavery and the application of the Missouri Compromise to the new lands. The fact that it also gave to the United States vast mineral wealth, especially gold, and a door to the Pacific Ocean and the Orient has not blinded sober historians to other sides of this episode in the troubled relations between the United States and a weaker neighbor.

## MEXICO—A New Nation with an ANCIENT HERITAGE

MEXICO. The United States has only two immediate neighbors—Mexico on the south and Canada on the north. With Canada, the American people share a common language and much the same racial and historical background. They have no such direct and simple ties with Mexico. The great segment of the New World called Latin America begins at the Mexican boundary, with profound differences not only in language but also in culture and tradition (*see Latin America*). Mexico has in addition many traits that distinguish it from the other Latin American countries.

For the United States and Mexico to get along with one another, as good neighbors must, the people of the two countries need to understand the differences between them as clearly as possible. Fortunately, the story of Mexico is for Americans one of the most interesting chapters in the history of the New World.

Mexico is young as a nation—younger than the United States. But its distinctive culture is far older, for it is essentially an Indian nation. The people who lived there when the Spanish conquerors arrived were not destroyed or uprooted as were the Indians in the rest of North America. True, many of them were enslaved for a time, but in the end they merged with their conquerors and absorbed them.

From the newcomers the Mexicans took their language and their religion. But they kept most of the characteristics and many of the customs of their Indian ancestors—ancestors who, long before the white men came, had reached a high degree of social organization. In the early years of the 19th century they won their independence from Spain. Since then, partly by gradual adjustments, partly by violent revolutions, they have tried to work out a free and democratic civilization suited to their needs and their tastes.

To know something of those needs and tastes is the first step toward understanding. The visitor who assumes that the Mexican people are striving toward the same way of living as the people of the United States will misjudge the country. They care less for material comforts and business efficiency than do Americans.

They want more time to enjoy the simple, personal side of life—home, family, friends, pleasant conversation. By the standards of foreigners who can afford a trip to Mexico, a large number of the people seem to live in great poverty. But the poorest adobe hovel is likely to be gay with flowers and with cages of songbirds. And the people living there will meet the visitor with dignity, warmth, and kindness.

The work of a Mexican's hands is usually a thing of art—woven baskets and blankets, hammered silver jewelry, delicately molded pottery. The very vegetables in the market place are arranged in patterns with an artist's eye for color. From this native feeling for decorative beauty comes the boldness and originality of the great Mexican painters—Diego Rivera, Orozco, Siqueiros, and others—whose work has had a world-wide

influence. Throughout the nation evidences multiply of progress, extension of education, rising standards of living; but the results are never likely to be identical with those achieved in the United States. They will continue to be distinctively Mexican creations—made in Mexico for the Mexicans.

### A Rugged and Beautiful Land

To know the Mexican people we must look first at the rugged and picturesque land in which they live. On the map Mexico seems dwarfed by the great land mass of the United States and Canada. But it is by no means a small country. Its area of 767,000 square miles is one-fourth that of the United States. If it

CONFIDENT EYES ON THE FUTURE



These are typical young people of Mexico City, alert, capable, proud of their heritage. Behind them rises the ancient cathedral whose foundations were laid long before the Pilgrims landed on Plymouth Rock.



were laid upon the face of Europe, it would extend from northern Denmark to the tip of Italy's boot.

Mexico is shaped like a great cornucopia. The open top of the horn borders the United States for 1,800 miles. It tapers southeastward for 1,900 miles and curls its tip around the Gulf of Mexico. At each end of the cornucopia is a great peninsula—on the northwest, the long, narrow finger of Lower California; on the southeast, the thick blunt mass of the Yucatan peninsula. The narrowest part of the mainland is the Isthmus of Tehuantepec in the far south where the Gulf of Mexico and the Pacific Ocean are only 150 miles apart.

#### The Three Natural Regions

The mainland as a whole may be compared to a three-story house. The first floor is a strip of lowland 10 to 100 miles wide along both the east and west



This cross-section of Mexico shows the position of the three regions discussed in the text—the coastal lowlands, the outer mountain slopes, and the interior plateau.

coasts. This first floor is very hot. In the north it is desert, or near-desert. Farther south, where there is more rain, it is steaming jungle.

From the lowlands rise great mountains, 10,000 feet high. With their sheer, clifflike faces and mile-deep canyons they form barriers between the coasts and the interior of the country. On the lower slopes of these mountains, facing the cool, moist sea breezes, are banana and coffee plantations. Countless valleys notched in the mountain sides hold little villages whose people raise tropical fruits and vegetables. This is the second story, where the climate is warm but mild.

Behind the mountains, in the interior, is the third story, a lofty plateau which occupies about 30 per cent of the total area of the country. To reach the plateau from the coast (from Vera Cruz, for example), one has to climb nearly 9,000 feet over the mountains; then drop down about 2,000 feet on the other side to the plateau level.

In the north the plateau is a continuation of the high plains of Arizona, New Mexico, and western Texas. It rises from an elevation of 3,000 feet at the border of the United States to 8,000 feet near Mexico City, the capital of the country.

#### Mountain Ranges and Volcanoes

The mountains which enclose the plateau form a pattern like a giant wishbone. The western arm is called the Sierra Madre Occidental, the eastern arm the Sierra Madre Oriental. In the south, just below Mexico City, the arms meet and continue down to the isthmus as a single range, the Sierra Madre del Sur (of the south). Where the ranges meet, the country is crossed from east to west by a line of volcanoes. Included among them is the snowy cone of Mount

Orizaba, third highest peak in North America (18,700 feet) and Popocatepetl (17,887 feet).

Like most volcanic countries, Mexico is sometimes shaken by earthquakes. The most severe occur in the south, on the Pacific side. In 1943 a new volcano appeared in the state of Michoacán, southwest of Mexico City. Its cone sprang out of a level field, reaching a height of a hundred feet in three days.

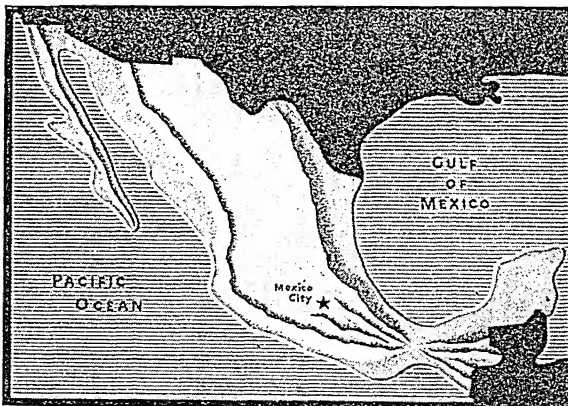
#### The Southeast Highlands

South of the volcanic peaks the southern Sierra Madre becomes a wild confusion of gorges and knife-like ridges. Although the general elevation is lower than on the plateau, flat places are few. The cities, like Oaxaca (*wā-hā'kā*), lie in deep valleys or, like Taxco (*tās'kō*), cling to almost vertical slopes. Many a town steps up a thousand feet from its lowest to its highest dwellings. Wheeled vehicles are impractical. Only men and burros can manage to scramble up the steep paths.

The southern Sierra slopes down and ends at the Isthmus of Tehuantepec. Then beyond the isthmus the land rises again to form the highlands of Chiapas (*chy-ā'pās*). These rugged highlands range along the Pacific coast and continue across the boundary of Mexico into Guatemala. On the Gulf side they fall off to a coastal plain that extends into the great curve of Yucatan (see Yucatan).

#### Where the Mexican People Live

As we have seen, mountains, deserts, jungles, and swamps cover a great part of Mexico. Railroads and highways are few. Thousands of villages are connected with the outside world only by burro trails. Great sections of the country have no overland communication with one another. Lower California is reached from the mainland chiefly by airplane or boat, and



The general pattern of Mexico's principal mountain ranges is shown here. We see again how they divide the country into three regions, the largest of which is the high plateau area.

the only practical way to visit Yucatan from the capital is to fly across the Gulf of Mexico. The land journey over mountains, through tropical rain forests and coastal marshes, is virtually impossible.

**The Central Plateau.** The heart of Mexico is the portion of the high tableland that lies in the southern apex of the two great mountain chains. It is

## A RUGGED LAND OF VIOLENT CONTRASTS



Notice the odd shape of Mexico with the long arm of Lower California extending southward, while the Yucatan peninsula hooks almost as far to the north. This relief map shows plainly the eastern and western Sierra Madres which rise like walls between the flat coasts and the high plateau. In the south they meet the volcanic region from Cape Corrientes to Vera Cruz. South of Mexico City lies a wild country pierced by the canyon of the Balsas River. The parallel ranges of Chiapas east of the Isthmus of Tehuantepec are clearly indicated. Three branching railroad lines connect Mexico City with the United States.

called the *mesa central* (Central Plateau). Here, nearly half of the total population lives. The Indians who migrated into this country from the arid north hundreds of years ago named it Anáhuac, "land of lakes." Here is water, and level land for farming, and a cool, refreshing climate. The snow-crowned volcanic ranges are the source of many streams, and in the valleys lie shallow lakes and ponds. On their banks grow emerald patches of corn and wheat, and the great spiky rosettes of gray-green maguey. In the high valleys lie ancient and lovely cities—Mexico City, 7,500 feet above the sea; Guadalajara at 5,000 feet, Puebla at 7,150 feet, Toluca at 8,600 feet, Morelia at 6,200 feet. This part of Mexico was densely populated before the Spanish conquest, and around the cities built by the Spaniards in the architecture of their homeland are many villages which are still purely Indian, as they were 500 years ago:

*The Northern Plateau.* About 20 per cent of the people live on the Northern Plateau. This region is lower, drier, and hotter than the Central Plateau. Most of it is a vast desert, crossed by jagged, isolated mountain blocks. Between the mountains are basin-like hollows that become lakes in the brief summer rainy season. Those around Torreón are large enough to irrigate great tracts of cotton and wheat. On this Northern Plateau are the great *haciendas*, or ranches, many thousands of acres in area, devoted chiefly to cattle raising. Minerals, however, provide the greatest wealth of the region, and most of the population is concentrated in the old mining centers of Monterrey, Durango, Zacatecas, and San Luis Potosí.

*The Coastal Lowlands.* The east coast as far south as Tampico is similar to the Texas gulf region and, like Texas, is rich in oil. From Tampico south to the Isthmus of Tehuantepec is a fertile, well-watered

## FACTS ABOUT MEXICO

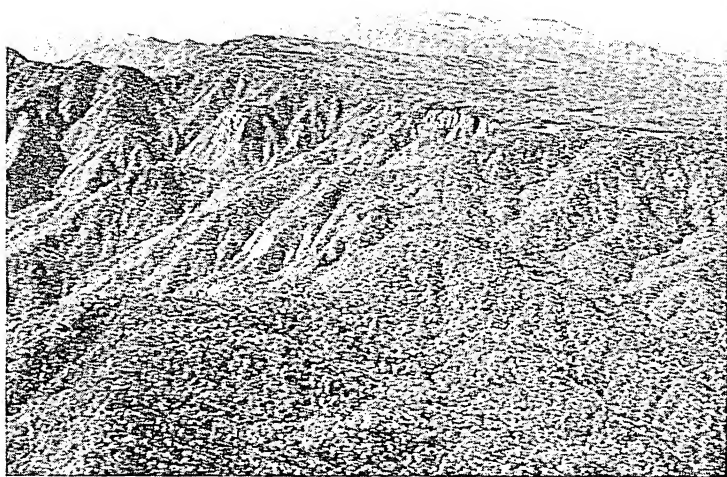
**Extent.**—Greatest length (northwest to southeast), more than 1,900 miles; width, from 1,800 miles along the northern boundary to 130 miles at the Isthmus of Tehuantepec. Area, 767,198 square miles (including island groups off the coast). Coast line, 1,727 miles on Gulf of Mexico and Caribbean Sea; 4,574 miles on Pacific Ocean (including Gulf of California). Population, about 19,500,000.

**Natural Features.**—Mountain ranges: Eastern Sierra Madre and Western Sierra Madre (highest peaks: Orizaba, about 18,700 feet; and Popocatepetl, 17,887 feet); Central Plateau, 6,000 to 9,500 feet. Principal rivers: Rio Grande, Conchos, Sonora, Yaqui, Fuerte, Lerma, Balsas, Moctezuma, Papaloapan, Grijalva, Usumacinta. Lake Chapala, 70 miles long and 20 miles wide, between states of Jalisco and Michoacán; numerous small lakes and lagoons.

**Products.**—Petroleum; silver, gold, copper, lead, zinc, antimony, mercury, arsenic, graphite; corn, cotton, wheat, chick-peas, rice, sisal hemp, coffee, cacao, chicle, beans, sugar cane, tobacco, fruit; live stock; sugar and tobacco manufactures, textiles.

**Cities.**—Mexico City (capital, over 1,000,000); Guadalajara (185,000); Monterrey, Puebla, Mérida (over 100,000); San Luis Potosí, León, Aguascalientes, Vera Cruz, Tampico, Morelia (over 50,000).

## TABLELAND AND TIMBERED MOUNTAINS



On the western edge of the Central Plateau lies Guadalajara (above), capital city of the state of Jalisco. Notice the many streams flowing between jaggedly eroded banks. These streams join the Rio Grande de Santiago to plunge 5,000 feet to the sea. The mountainous region (below) along the plateau's border contrasts with its flatness. This area with patches of level upland is covered with forests.

belt of grassland and tropical forest. When fully developed it will be one of the most productive agricultural regions in the country. Cacao, tobacco, vanilla, bananas, and coffee are cultivated. The near-by forests yield rubber, mahogany, and dye woods. Vera Cruz, on the hot, wet coast, is the country's chief seaport (see Vera Cruz). Inland from Vera Cruz, on the mountainside, are Córdoba (altitude 2,700 feet) and Orizaba (altitude 3,900 feet), important manufacturing and resort centers.

The west coast is very thinly populated. In the north, between the mountains and the Gulf of Califor-

nia is the Sonoran Desert, one of the most desolate, lifeless areas in North America. Farther south, on a plain 10 to 50 miles wide, mountain streams irrigate large cattle ranches and farms that grow fruits and vegetables. Below Cape Corrientes, on the Pacific coast, the mountains rise almost from the water's edge, and tropical jungle clothes their lower slopes. Acapulco has the only good harbor on the coast, but the country behind it is so precipitous that no railroad has ever been built into the interior. Today, with the opening of an automobile highway to Mexico City, it is one of the most popular tourist resorts in the country. Manzanillo and Mazatlán, both at the mouths of silt-laden rivers, have rail lines to the plateau.

## A Vertical Climate

Mexico's climate varies, not from north to south, as in the United States, but from sea level to mountain top. As we have seen, the coasts are tropical. The hot land (*tierra caliente*) lies below 3,000 feet elevation. From 3,000 to 6,000 feet is the temperate zone (*tierra templada*), and above 6,000 feet is the cold zone (*tierra fría*). Within any one zone, seasonal changes of temperature are comparatively slight. There is greater difference between day and night than between winter and summer. In Mexico City, in the cold zone, the annual average temperature is 60.1°F. January, the coldest month, averages 54.3°; May, the warmest month, averages 65.1°—a variation of only 10.8°.

In most places, water is more precious than silver and seems less abundant. Northern Mexico, with only 10 to 20 inches of rain, is desert or semidesert. The Central Plateau, though more favored than the north, still does not have a dependable water supply. Mexico City averages only 23 inches of rain a year, most of which falls during the rainy season between June and November.

In the winter, cold air masses known as "northers" occasionally sweep down over plateau and coast, bringing frost and rain. To retain on the plateau the seasonal rains that now wash into the sea is one of Mexico's most expensive problems. Whenever effective irrigation is accomplished the country's eternal land problem will be far on the road to solution.

On the southeast coast the warm trade winds send torrents of rain crashing against the mountainsides—as much as 150 inches a year in Tabasco and Vera Cruz. Little of it reaches the plateau behind the Sierras. On the southwest coast a local summer mon-



soon interrupts the prevailing dry winds and brings moisture from the warm waters of the Pacific.

#### Rivers More Scenic Than Useful

Mexico has few important rivers. The majority of them are thin streams trickling and tumbling through deep gorges, called *barrancas*, carved by summer floods. The Rio Grande de Santiago plunges 5,000 feet to the Pacific through a 200-mile canyon that starts near the city of Guadalajara. In wild scenic beauty this great gorge rivals the Grand Canyon of the Colorado. The Rio Moccizuma passes through a canyon 400 miles long and hundreds of feet deep. It is one of several streams that drain the Central Plateau and then unite to form the Pánuco River, which empties into the Gulf at Tampico. The Lerma River flows across the Central Plateau to Lake Chapala, the country's largest lake (70 miles long by 20 miles wide). The Rio Balsas has opened a gulf thousands of feet deep that cuts through to the Pacific from the broken volcanic region south of Mexico City. The Grijalva and Usamacinta rivers drain the region east of the Isthmus of Tehuantepec.

Most of the streams on the Northern Plateau have no outlet to the sea and are lost by evaporation. The only important one is the Rio Grande (known in Mexico as the Rio Bravo del Norte) which forms the boundary with the United States (see Rio Grande).

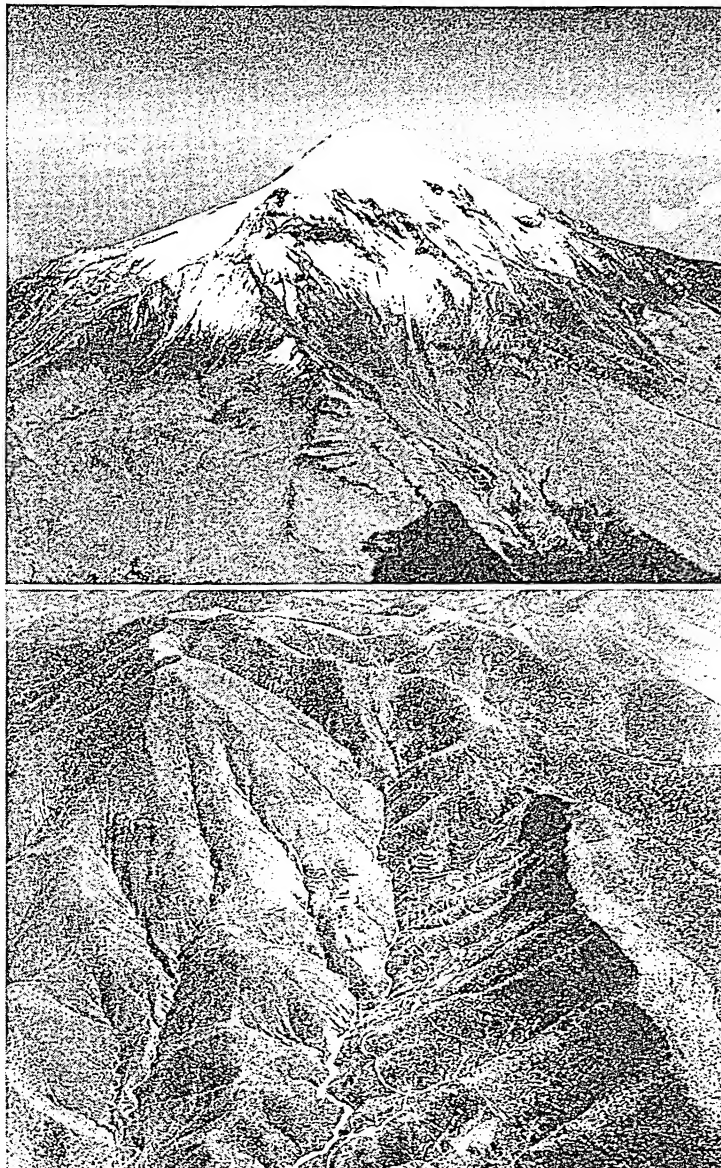
None of Mexico's rivers is navigable for any distance above its mouth, and the canyons only add to the difficulty of unifying the land by rail and highway.

#### The People and Their Origins

About 60 per cent of the people of Mexico are *mestizos*, or mixed Indian and white; about 30 per cent are pure-blooded Indians; and the remaining 10 per cent are pure white. History helps to explain the dominance of the *mestizos*. The United States was populated by colonists and immigrants who brought their families with them. They drove out the Indians or isolated them on reservations. Mexico was exploited by a small group of adventurers who brought along few women. They came, as Cortez himself expressed it, "to get gold, not to till the soil like peasants." According to official records, less than 300,000 Spaniards entered the country during the entire colonial period. Many returned to Spain. Others married Indian women, and the first generation of *mestizos* was born.

Since independence was declared in 1821, the number of European immigrants to Mexico has been negli-

#### RUGGED PEAKS AND BARREN RANGES



The snow-crowned volcano Mount Orizaba (above) is the highest point in Mexico and the third highest in North America (18,700 feet). In the picture below we see how the mines and mining villages perch like swallows' nests on the steep faces of the cliffs carved by swift-running streams. This rich mineral region is in the state of Zacatecas on the Northern Plateau.

gible. There was no desirable free land to attract farmers, and unskilled foreign workers could not live on what the native peon earned. Immigration laws, moreover, have always been restrictive. In colonial times non-Spanish people were not allowed to settle in Mexico. Today the law prohibits the entrance of laboring immigrants, of small investors who intend to devote their capital exclusively to commercial enterprises, and of most professional people.

With little new blood coming in, the rapidly increasing *mestizos* were left to possess and control the country. They now supply Mexico with most of its

## THE ENDLESS LABOR OF HOME AND FIELD



Corn for tortillas is soaked in warm lime water, ground into a moist paste on a three-legged stone *metate*, and then shaped into flat round cakes and fried on a tin brazier. For centuries wooden plows have been used to cultivate the corn.

political and intellectual leaders. From them has come the gradual movement toward racial and cultural unification.

A sense of national unity has formed slowly. When the Spaniards came, some 700 distinct Indian tribes were living in Mexico, kept apart by the broken character of the land. The one unifying influence came to be the Roman Catholic church. Arriving with the conquistadors, the priests introduced among the Indians the arts of civilization and modified the brutalities of their conquerors. The insistence of the church that the Indian had a soul worth saving resulted in laws for his protection which perhaps saved him from extermination. Today more than 90 per cent of all Mexicans profess the Roman Catholic faith.

The pure-blood Indians, however, have on the whole remained in their old communities and held to their own ways of life. They still speak more than 50 different languages and dialects. Their loyalty is to the village rather than to the nation. The tribes are foreigners to one another, different in physique and character. Whatever political and economic bonds may be formed between them must be provided by the mestizos.

The 10 per cent of pure whites of Spanish descent remaining in Mexico are concentrated in Mexico City and the other large urban centers. They tend to cherish their aristocratic ancestry and to discourage the marriage of their sons and daughters to mestizos; but of necessity they merge without distinction into the business and political life of the country.

About 160,000 foreigners are residents of Mexico. The majority of them are engineers, technicians, and businessmen associated with the properties owned by foreign companies.

The population of Mexico today is about three times what it was when it won its independence in 1821.

Although it has the world's highest birth rate (43.5 per thousand), it also has the second highest death rate (23.3 per thousand).

#### How the Mexicans Live

The typical Mexican, who makes up nearly three-fourths of the population, is a farmer. He lives in a village, as his Indian ancestors always lived, although the village has been modified in appearance by the Spanish influence.

Its center is the public square, called a *plaza* or *zócalo*, with tree-shaded paths and gardens, fountains, and bandstand. On one side stands the church. The local government buildings and the arcades of the public market also face the plaza. Often the school is here and the long water tanks where the women gather in the morning to do their laundry and chatter as they work. On market and fiesta days the drowsy, sun-patterned square leaps into life and all is color and movement.

From the square the cobblestone or dirt streets lead off into the plains or hills. The houses are half hidden behind hedges of living organ-pipe cactus, or adobe walls draped with masses of flowering vines—scarlet and purple bougainvillea, roses, lemon yellow *alamanda*, or other gay blossoms.

The poorest home is a one-room, windowless, floorless hut of stone or adobe brick with a thatch roof. In the lowlands the house is made of bamboo, or of stones and brush. The more prosperous home consists of several buildings with red tile roofs, grouped about a courtyard and enclosed within a wall.

The family sleeps on woven straw mats called *petales* or, in the lowlands, in hammocks. Cooking is done in the courtyard over a simple charcoal brazier. The staple food is the *tortilla*, a flat cake made of corn meal. One of the most characteristic of all Mexican sounds—as universal as the silvery chime of the

church bells—is the quick pat-pat of the women's hands as they shape the moist meal into a cake for frying. Boiled black beans (*frijoles*) are second only to corn in importance. Because water is so scarce most of the people drink *pulque*, made from the fermented sap of the maguey or agave (see Agave).

#### Clothing of the Country People

The master of the household wears woven leather sandals (*huaraches*), though his wife and children are usually barefoot. His suit looks like pajamas. It is made of a coarse white cotton cloth called *manta*, and has a baggy seat and loose legs, gathered in tightly at the ankles. A big sombrero and a woolen blanket, or *serape*, complete his costume. The serape serves as an overcoat and is worn folded over one shoulder when not in use. All his personality is expressed in the tilt of his sombrero and the fling of his serape.

Every woman wears the *rebozo*, which is a shawl, usually of dark blue cotton. Like the man's serape, it is her only protection against cold, wind, and rain. Worn folded on the head it serves as a sunshade. Skillfully twisted over her shoulder and around her waist it will support a baby or a tired child, leaving her arms free for the perpetual work of field and household. In Yucatan, the lowlands of Tehuantepec, and the remote mountain valleys of Chiapas, the beautiful tribal costumes of olden times are still worn.

#### Gay, Carefree, and Independent

The "wantlessness" of the average Mexican is the despair of foreign salesmen. He raises only enough food for his family. With his own hands he makes most of his simple household necessities. A skillful craftsman, an instinctive artist, he works for love of the task and only incidentally for money. In the weekly market of his own or neighboring villages he exchanges whatever surplus he may have for salt, gunpowder, a bolt of cotton cloth. If anyone meeting him on the road should attempt to purchase his entire stock, he would refuse to sell. For the market is a social event, and with nothing to barter he would miss all the fun.

Frequent fiestas provide color and gaiety. They center about the saints' days and other celebrations of the Roman Catholic church, but many of the dances and ceremonies are survivals of ancient Indian rituals. The beauty of these fiestas with their elaborate costumes, their flowers, fireworks, and the ceremonial use of candle and fire light can never be forgotten.

#### The People of the Cities

Most of the city dwellers are almost as poor as the farmers. The laborers live in one or two-room tenements. They wear shoes instead of huaraches, blue denim overalls instead of white trousers. They sleep on beds, eat a little better, see an occasional movie, even own a

radio. But not more than 5 per cent of the Mexican people enjoy the comforts that middle-class Americans take for granted.

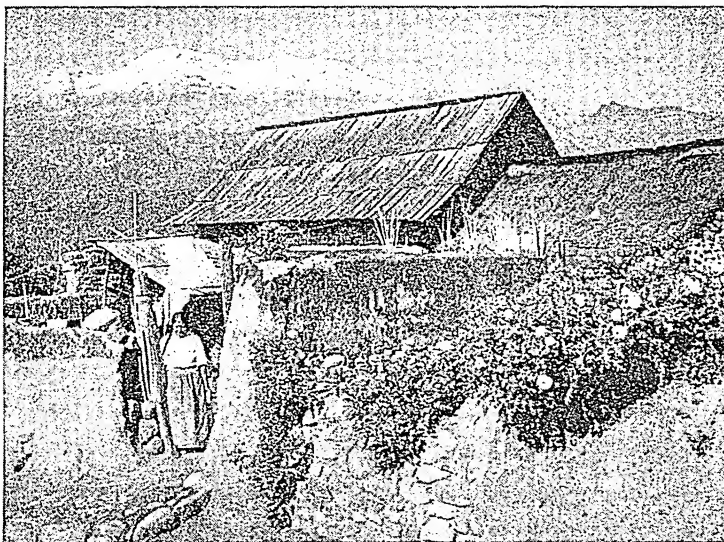
The homes of the well-to-do—the professional and businessmen, the hacienda owners, and the government officials—are often built in the Spanish colonial style of architecture. Many beautiful homes of the Spanish period, 200 to 300 years old, still remain. The life of the household faces inward on the patio, or courtyard, with its gardens, fountains, and caged birds. A large house may have several such patios. Modern architecture is found in the new subdivisions of the large cities.

#### The Children of Mexico

The children of Mexico are having a share in the life and future of their country beyond anything their fathers knew. They are eager, curious, friendly, and quick to grasp anything new.

In the cities among the professional classes and the merchants, or on the large plantations, the young people are not unlike those of the United States. Most of them go to private schools, dress as American children do, play the same games. Before the war, toys came from Germany and Japan, dolls from France. Books for Mexican children have always been few; and these have been largely translations from the classics of other countries: French and German fairy tales, Robinson Crusoe, Pinocchio, and stories about the saints. Some Mayan folk-tales and the stories of Don Coyote are among the few of native origin. But they have the Walt Disney books that have followed the cartoons. The boys of well-to-do parents nearly all own at some time a *charro* suit, consisting of tight trousers with ornamental buttons down the legs, a short jacket, flowing tie, and elaborate sombrero. They wear it as our boys wear cowboy suits, playing the

MEXICAN HOME—DUSTY AND SUN-BAKED



With its adobe wall and profusion of flowers, this dwelling is typical of village homes throughout the plateau. In the distance lies the snow-crowned volcano Ixtaccihuatl, beloved "White Woman" Mountain.



oxen, the horses, the goats, and the sheep to be blessed that they may keep well and multiply.

#### Farmers Without Land

Mexico is a nation of farmers on land that nature never intended to be farmed. Seventy per cent of the people are attempting to wrest a living from only 7 per cent of the land. The rest is mountain, desert, or forest. This small amount of arable land is equal in size to the state of North Carolina, but it is unfavorably distributed in many isolated and widely separated patches, remote from centers of population or means of communication. At least half of it lies fallow each year. Harvests on the remainder are further reduced by drought, frost, diseases, and the primitive methods of cultivation. The result is that Mexico does not produce enough food to feed its people.

The staple food and principal crop for unknown centuries has been corn. Three times as much corn is planted as wheat, rice, and beans combined. The methods of cultivation have changed but little since Aztec times, with the result that the yield averages only 8.7 bushels an acre, as compared with 23 bushels an acre in the United States. Corn is one of the most soil-exhausting crops. A cornfield (*milpa*) can be planted only two or three seasons, then must lie fallow for several years, for the average farmer cannot afford to buy fertilizers. Many economists believe that Mexico should stop growing this cereal altogether and put the land to more profitable use.

Beans (*frijoles*) are second in acreage and in importance as a food staple. They are grown throughout the country. Cotton is cultivated under irrigation in Lower California and on the Northern Plateau. About half of it comes from the communal farms of the lake district around Torreón. Mexican cotton mills

use most of the product. Wheat suffers from uncertain rainfall and lack of irrigation. The most productive areas are the Central Plateau and the north Pacific coast. Sugar cane was one of the first crops developed by the Spanish. Large areas suitable for cane are yet undeveloped, especially on the hot Gulf coast. Tobacco of fine quality grows on the coasts and in the southern state of Oaxaca. Practically all of it is used in the 200 or more cigar and cigarette factories. A fine quality of coffee comes from the seaward slopes of Chiapas and Vera Cruz at altitudes of 2,500 to 4,000 feet. About a third of it is exported to the United States. The irrigated river valleys of the west coast along the Gulf of California are producing high-grade winter vegetables for export to the United States. Tomatoes were grown by the Aztecs, who gave us the word (in the Nahuatl language, *tomatl*). Both temperate- and tropical-zone fruits are cultivated commercially. Vanilla, castor beans, and

#### SKILLFUL AND ARTISTIC CRAFTSMEN



In most of the Indian villages the people specialize in some particular craft. Some make rush-bottomed chairs (upper right). Others turn out pottery of distinctive design (lower right). The intricate floral pattern this artist is painting is original and spontaneous. The old woman (lower left) is preparing fiber from the maguey plant. It will be woven into rope or made into baskets.

cacao are among the many tropical plants produced for export. Guayule, a source of rubber, grows wild on the Northern Plateau (see Guayule). Old rubber plantations are being rehabilitated in the southeastern states, and production is growing rapidly.

The grasslands of the Northern Plateau have been devoted to cattle raising since colonial times. The breeds are inferior, due to poor pasturage, scanty water supply, and neglect. Tallow and hides are the chief commercial products.

From Yucatan comes half of the world's supply of henequen, a cordage fiber (see Sisal). This is the most valuable agricultural export. Another useful fiber plant extensively grown on the Central Plateau is maguey (see Agave).

Magnificent forests occupy about one-fifth of the total land area. Chicle, the basis for chewing gum, is the most valuable forest product. Most of the world's supply comes from the Yucatan peninsula and adjoining areas in Guatemala and British Honduras. Valuable cabinet- and dyewoods are exported, but large areas are undeveloped because of the difficulties and expense of transportation.

#### Land and the Hacienda System

The form of land holding is highly wasteful. In 1930 nearly 90 per cent of the agricultural area was held in haciendas. By definition a hacienda comprises at least 1,000 hectares (2,471 acres). The average size is 7,000 to 8,000 acres, but some exceed 50,000 acres. Although many of these great estates have been broken up since the last census and their lands distributed to the people, they are still the prevailing form of land tenure. The owner, the *hacendado*, is more interested in politics than in agriculture. He lives in the capital city or abroad and visits the manor house at rare intervals.

Scattered over the immense estate are the villages of the peons—the share croppers and hired laborers. Once virtual slaves of the *hacendado*, they are now given some protection by law, which requires that they be paid a minimum wage and be given decent living quarters, schools, and a tract for subsistence farming and grazing of domestic animals. Peonage, or debt bondage, is still common in actual practise, but many hacienda workers are now organized in their own trade unions and can demand that the law be observed.

A new form of land ownership is the *ejido* (*ā-hē'dō*), or coöperative farm. Managed in common by a village or group of farmers, it is financed and supervised by the federal government.

#### History of the Coöperative Farms

The revolution which broke out in Mexico in 1910 grew out of land abuses extending back more than 300 years. When the Spaniards conquered Mexico, they distributed its best lands among a few families in huge grants known as *encomiendas* or "trusts." The Indians went with the land, becoming virtual slaves of the new owners.

The Aztec communal lands, owned by the village or clan and cultivated in common, were retained by the Spanish under the name of *ejidos*, meaning "way out," because they lay on the outskirts of the villages. The Indians supported

themselves on the *ejidos* in whatever time they could spare from labor on the master's estate. In the course of time most of the *ejidos* were swallowed up by the haciendas. During the long dictatorship of Porfirio Díaz (1877 to 1910), the last of them were given to political favorites and foreign speculators. The concentration of land ownership exceeded anything known in modern times. By 1910 less than 4 per cent of the farmers owned any land, while the estate of one family on the Northern Plateau equaled the combined area of Denmark, Switzerland, and Holland. Reduced to day laborers on their own ancestral lands, the peons were paid the equivalent of about five cents a day. This was virtually the same wages they received in 1792, but in the meantime the price of corn had increased 179 per cent, beans 565 per cent, and chili 123 per cent. Many peons ran away from the haciendas to become starving vagrants, willing to follow any leader who promised them relief from their bitter poverty. And so the stage was set for the revolution.

"Land and Liberty" was its battle cry. Presently, this goal found its expression in Article 27 of the Constitution of 1917, which empowered the government to break up the large estates and restore the *ejidos* to the people. For 20 years the program proceeded slowly, haltingly. Then, under the administration of President Lázaro Cárdenas, 1934–1939, more land was distributed than in all the years preceding—45½ million acres in five years. At the end of his term about 17 per cent of the arable land was in *ejidos*, the balance being privately owned.

Title to an *ejido* was held by the state on behalf of a village or a group of farmers coöperatively organized. It could not be sold, leased, or mortgaged. Government surveyors marked out the land, and a village committee then assigned lots to heads of families called *ejidatarios*. Each lot comprised at least four hectares (about ten acres) of irrigated or fertile land, or a larger amount of less productive land. The *ejidatario* could hold his plot for life and bequeath it to his heir, but if he did not cultivate it for two years in succession it was taken from him. The National Bank for Ejidal Credit financed the farms, granting loans for seed, animals, machinery. It built irrigation systems and marketed the commercial crops. Loans were made only to coöperative groups, not to individuals.

The largest government-financed *ejidos* were in the Laguna (lake) district around Torreón on the Northern Plateau, where half a million acres were taken from five families and given to some 40,000 peasant families. The sugar-cane district of the state of Morelos, the wheat lands of Sonora, and the henequen plantations of Yucatan were also made into collective farms.

Mexican owners of expropriated lands are paid in agrarian bonds. American landowners are being paid in cash through the Agrarian Claims Commission.

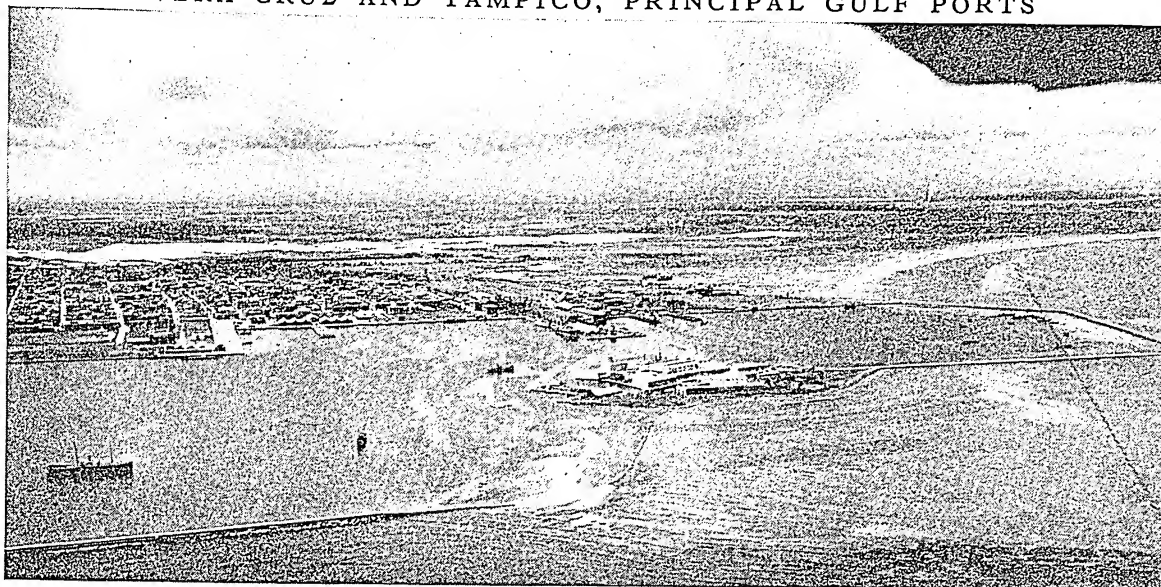
The *ejidos* have had varied success. Some have prospered, others have failed. Critics of the system argue that government-controlled land banks have been as corrupt and ruthless as the worst of the *hacendados*; that the peasant is incapable of working for himself and will never raise a crop surplus. When Avila Camacho came into the office of president in 1940 he decreed that individual titles of ownership be given to all land. The lands may, however, be worked coöperatively.

#### Enormous Mineral Wealth

In the mountains and beneath the deserts that are so unfriendly to agriculture lies untold mineral wealth. Gold and silver drew the Spaniards like a magnet across the seas. Cortez told one Aztec lord that the Spaniards were "troubled with a disease of the heart for which gold is a specific remedy."

On the slave labor of the Indian the Spaniards grew fabulously rich. The Count de Regla, on the occasion of his son's christening, paved the street from his house to the cathedral with ingots of silver.

## VERA CRUZ AND TAMPICO, PRINCIPAL GULF PORTS



The splendid palaces of the silver kings made Mexico City one of the most beautiful capitals in the world. In gratitude for their easy riches they built magnificent churches which are literally encrusted with precious metals.

Minerals and oil are still the country's greatest source of wealth and account for almost three-fourths of the total value of exports, although they employ only 2 per cent of the workers. Silver is first in value. Mexico supplies 30 to 40 per cent of the world's annual production, 10 per cent of it from a single mine which has been worked since Montezuma's time. In the production of lead Mexico is second to the United States, and it is among the leaders in gold, zinc, and copper. It is the United States chief source of graphite, antimony, and mercury—three of the strategic war materials. Reserves of tungsten, arsenic, and cadmium are huge. Near the Texas border, around Sabinas, are enormous deposits of coal which have scarcely been touched. The Cerro de Mercado, near Durango, is a fabulous hill of iron estimated to contain 460 million tons of high-grade ore.

Petroleum reserves cover about 150 million acres along the gulf coast extending 100 miles inland. Only 15,000 acres are developed. The oil goes by pipe line and by barge on the Pánuco River to Tampico.

From a peak of 194 million barrels in 1921, when Mexico ranked second to the United States, production has declined to about 40 million barrels, giving



Vera Cruz (upper) on the hot gulf coastal plain is Mexico's most important port. In the foreground is Fort San Juan de Ulúa. North of Vera Cruz is Tampico (lower), oil-refining center and shipping point. The broad stretch of water is the Pánuco River.

the country seventh place. Declining yield of old wells and political disturbances which have prevented exploratory work in new areas are responsible.

#### Oil and Expropriation

A dramatic episode during the régime of President Cárdenas was the nationalization of the oil wells.

At least 95 per cent of the oil properties were owned and operated by foreign interests, chiefly the United States and Great Britain, who obtained possession of them during the régime of Díaz. The framers of the 1917 Constitution maintained that Díaz had no right to sign away his country's resources, and in Article 27 they declared that direct ownership of all mineral deposits and subsoil resources is vested in the nation. Foreigners may acquire ownership in lands, water, or mines, or obtain concessions to develop them, only if they agree to abide by Mexican laws and not to invoke the protection of their own governments.



In 1937 the oil workers went on a strike, demanding higher wages and a share in the management of the properties. The dispute was submitted to the Labor Board, which upheld the workers. The oil companies requested an injunction, but the Supreme Court denied the injunction and sustained the findings of the Labor Board. The companies still refusing to comply with the award of the courts, President Cárdenas on March 18, 1938, expropriated their properties. All oil is now nationally owned and produced.

The British government was not satisfied with the indemnity offered, and diplomatic relations between Mexico and Great Britain were broken off. The United States government, in the interest of the "good neighbor" policy, recognized Mexico's "right to expropriate properties within its jurisdiction" but insisted on compensation. In April 1942, after four years of negotiations, the two governments reached an agreement on terms of settlement and the matter was considered closed.

Mining and smelting are still 98 per cent controlled by foreigners. The United States has an investment of some 200 million dollars in Mexico's "number one" industry. The metals are sold abroad where the profits remain. Mexico retains only the taxes paid to the state and the wages paid to the miners.

#### Effective Transportation Handicapped

About 15,000 miles of main-line railroad serve the nation and bind it with the United States. The National Railways of Mexico are owned and operated by the government. Railroads suffer from old and inadequate equipment and the lack of branch lines to connect production zones with the leading markets. Railroad building is enormously expensive, particularly on the borders of the plateau, and no domestic capital is available. The old line across the Isthmus of Tehuantepec has been modernized with American aid. Connecting Puerto Mexico on the Gulf of Mexico with Salina Cruz on the Pacific, it is to serve as a supplement to the Panama Canal in the handling of freight and as an alternate to the canal in case of emergency. Both terminal ports were improved.

The Pan American Highway from Laredo, Tex., to Mexico City, a distance of 770 miles, has brought a profitable stream of tourists into the country. The road is being extended southward to Oaxaca and Tehuantepec and eventually will join with Guatemala's section

of this inter-American route. Most of the leading cities are now connected with motor highways, and bus transportation is highly efficient. Intervillage roads are still badly needed. Air lines are well developed, most of them owned and operated by foreign companies.

#### Manufacturing Unimportant

Although Mexico's manufactures have increased more than 600 per cent since 1902, the total value of about 200 million dollars annually is less than that of the agricultural state of Nebraska with one-twentieth the population. The possibilities for development, however, are unlimited. Raw materials are abundant and varied, and on the borders of the plateau power resources are immense. The crying need of the country is capital to develop industry, and capital is available only from foreign sources. The low purchasing power of the great majority of the Mexican people is also a major handicap to industrial development.

Mexico City is the leading manufacturing center, producing more than a fourth of the total value (see Mexico City). Food products are first in value and employ about a third of the industrial workers of the country. Cotton textiles occupy second place, with 15 per cent of the workers. The towns of Puebla and Orizaba are the centers of textile manufacture, utilizing water power from snow-fed streams racing down the edge of the plateau.

Monterrey is the "Pittsburgh" of Mexico, the center of its iron and steel industry. Raw materials are close at hand—limestone in the immediate vicinity, iron from Durango to the southwest, and coal from the

near-by Sabinas field. Next to Mexico City as a manufacturing and railroad center, Monterrey also has lead smelters and refineries, a large brewery, flour and cotton mills, tile, glass, soap, and tobacco factories, and railroad repair shops.

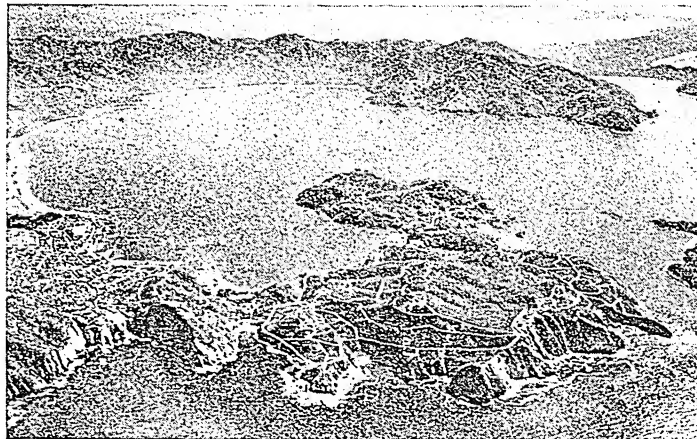
Vera Cruz is the center of tobacco manufacturing. The weaving of table linen is a new and prosperous industry in Oaxaca. Huara-

ches, or native-style woven sandals, are exported, chiefly from Oaxaca and Cuernavaca. Every village has its handicrafts.

#### Industrial Labor in Mexico

The lot of the industrial worker under Díaz was as intolerable as that of the peon. Those who agitated for better conditions were starved into submission. Article 123 of the 1917 Constitution is a "bill of rights" for labor. The Constitution in itself does not have the

ACAPULCO BAY ON THE PACIFIC COAST



The beautiful harbor of Acapulco lies at the foot of sheer mountains. The village is a popular tourist resort with many fine modern hotels.

force of law. Its provisions are enforced by the federal labor law, which was passed in 1931. This is one of the most elaborate and radical labor codes in existence.

Wages, hours, the protection of women and children, safety and hygiene, compensation for illness and accident are all prescribed in greatest detail. Trade-union membership is obligatory. Government boards of conciliation and arbitration settle all disputes, including dismissal of an employee. Discharged workers must be paid three months' salary. The Social Security Act of 1943 provides further protection by establishing compulsory insurance against unemployment, accidents, sickness, and dependency in old age. The Institute of Social Security administers the act.

The first union to appear under the protection of the new Constitution was the Regional Confederation of Mexican Labor (CROM). Its leader Luis N. Morones undertook a heroic task in organizing an illiterate, inexperienced, undisciplined people who had never before attempted coöperative action. One of his associates was a young intellectual, Vicente Lombardo Toledano, who broke with him to form in 1936 the Confederation of Mexican Workers (CTM). This is now the most powerful union, with a membership of about a million industrial and agricultural laborers. Toledano also organized the Latin American Workers' Confederation, an international union with headquarters in Mexico City.

The power of labor plus high tariffs and the expropriation of lands and oil have combined to limit the new foreign capital which is willing to invest in the country's further development.

#### Education—The Rural-School Movement

Mexico's rural-school movement is perhaps even more significant than the land and labor movements. The difficulties of providing education for the masses of the Mexican people are overwhelming. The poverty of the country limits expenditures for equipment and teachers' salaries. Attendance is very low, for so many of the children must work to supplement the family's pitiful income.

In spite of obstacles, remarkable progress was made. Before the revolution there was no rural school system. Compulsory education was unknown. Estimates of

illiteracy run as high as 90 per cent. During the first ten years of bloodshed nothing could be done about schools, although Article 3 of the 1917 Constitution provided for free secular education. The start was made under President Obregón in 1922 when the federal Department of Education was formed with

#### YOUNG AND OLD LEARN TOGETHER



These children are learning to read from the simple sentences and drawings on the wall. Notice that there is an old man in the front row learning with them. This rural school enjoys the luxury of desks and a blackboard. Many in remote mountain villages are not so well equipped.

José Vasconcelos as secretary. He turned the campaign against illiteracy into a crusade. Thousands of volunteer teachers offered their services. Their school was a corner of a patio, their entire equipment a plaster wall and a bit of chalk. Other men took up the work which Vasconcelos had begun. Starting with nothing in 1922, by 1938 they had established about 20,000 rural schools.

In 1933 the education clause in the Constitution was amended to exclude all religious teaching and place education entirely in the hands of the state. "The education imparted by the State shall be a socialistic one," read the amendment. The Roman Catholic clergy and a large proportion of the people in the rural districts raised a storm of protest. Even the National University expressed itself as opposed to the use of the schools for the propaganda of socialism. The antireligious teachings were later modified, and the word "socialism" is now understood to mean simply an educational program integrated with the life of the community. Reading and writing are subordinated to social welfare. In the school garden better methods of agriculture are demonstrated and new vegetables raised to improve the community's diet. Local crafts are revived as a supplementary source of family income. Hygiene and sanitation are not only studied in theory but put into practise. The

socialistic school is the "school of action." Mexican educators term it "The House of the People."

#### Secondary and Higher Education

The number of secondary schools is still extremely small; most of them are in the larger cities. Higher education is represented by the National University in Mexico City, founded in 1551, and the more modern and influential University of Morelia. The National College of Agriculture at Chapingo is leading the effort to improve Mexico's farming methods. In Mexico City are also the new Polytechnic Institute, the Normal School, and the Workers' University founded by Vicente Lombardo Toledano.

Friendly relations with Canada and the United States are furthered by the summer school of the National University, which is attended by almost a thousand students and teachers from the North. The Benjamin Franklin Library was organized in 1942 in Mexico City by representatives of the American Library Association and financed by the United States government. It has some 4,000 books in English and 1,000 in Spanish. Supplementing the Mexican libraries, it is an important inter-American educational link.

#### The Renaissance of Art

Under the patronage of the Department of Education the latent artistic talent of the country blossomed in work of great power and originality. The artists who were commissioned to decorate the new public buildings developed a school of mural painting which drew its inspiration from the hopes and dreams and struggles of the Mexican people. Diego Rivera, José Clemente Orozco, David Alfaro Siqueiros, Jean Charlot, Roberto Montenegro, and many others achieved world-wide fame. Their work stimulated in the United States a native fresco movement and contributed to the growth of regional painting, such as the Middle Western school of Grant Wood.

The children's art classes in the public schools have produced charming and original work which is winning the acclaim of painters and educators throughout the Western world.

Music, like painting, draws on native themes. Carlos Chavez, best-known composer and conductor of the Mexican Symphony Orchestra, is notable for his blending of Indian rhythms with the tempo of the modern mechanical world. His free concerts of classical

music for peons and children were highly successful. Silvestre Revueltas drew his inspiration from the songs of the *mariachis* and from the *corridos*. A typically Mexican ballad, the *corrido* is literally a "current happening." Sung to simple catchy tunes, the doggerel verses deal with any event of historic or momentary interest. The feats of the popular revolutionary heroes Villa and Zapata were the subject of endless *corridos*.

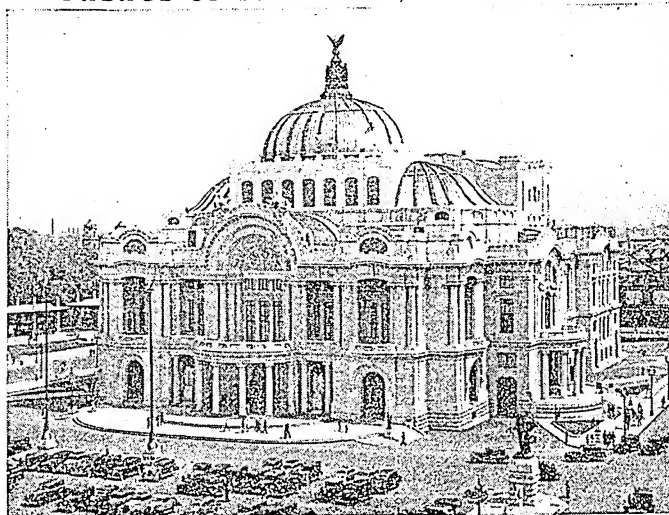
The Mexican film industry is growing in popularity throughout Latin America and is threatening the supremacy of Hollywood in those countries. It has been most successful in the field of comedy. Its outstanding actor is Manuel Moreno, the "Charlie Chaplin" of Mexico, known by the name of the character he created, the street vagrant Cantinflas. (See also Latin American Literature.)

#### History of Mexico

For centuries Mexico has been the cradle of wars—wars for possession of the scattered patches of arable land, the few dependable sources of water. The very name of the country is derived from the Aztec god of war Mexitli. It was Mexitli, so legend says, who drove away the mysterious white man, tall and bearded, who taught these primitive peoples agriculture, pottery making, weaving, and other peaceful arts. As he sailed into the East, whence he had come, he promised some day to return. The Mayas called him Kukulcan; the Toltecs and Aztecs named him Quetzalcoatl (*kět-sāl-kō-wā'll*). They made him a god and his symbol was the plumed serpent. Was he a real man, perhaps a Viking blown in his sailing vessel across the seas? Or was he a myth? History does not know, but to him the Mayas attributed the origin of their highly developed culture. In the jungles of Yucatan, Chiapas, and Guatemala these Indians from the 4th to the 9th centuries built the great cities whose ruins are the wonder of the modern world (see American Archeology; Yucatan). Their descendants are still the dominant racial element in these same regions.

By the end of the 10th century the warlike Toltecs had conquered most of central and southern Mexico. Their religious capital was Tula, which is now being excavated, about 40 miles from the present Mexico City. The Toltecs built the famous Pyramids of the Sun and the Moon and the Temple of Quetzalcoatl at San Juan Teotihuacán near Tula. They also built the giant

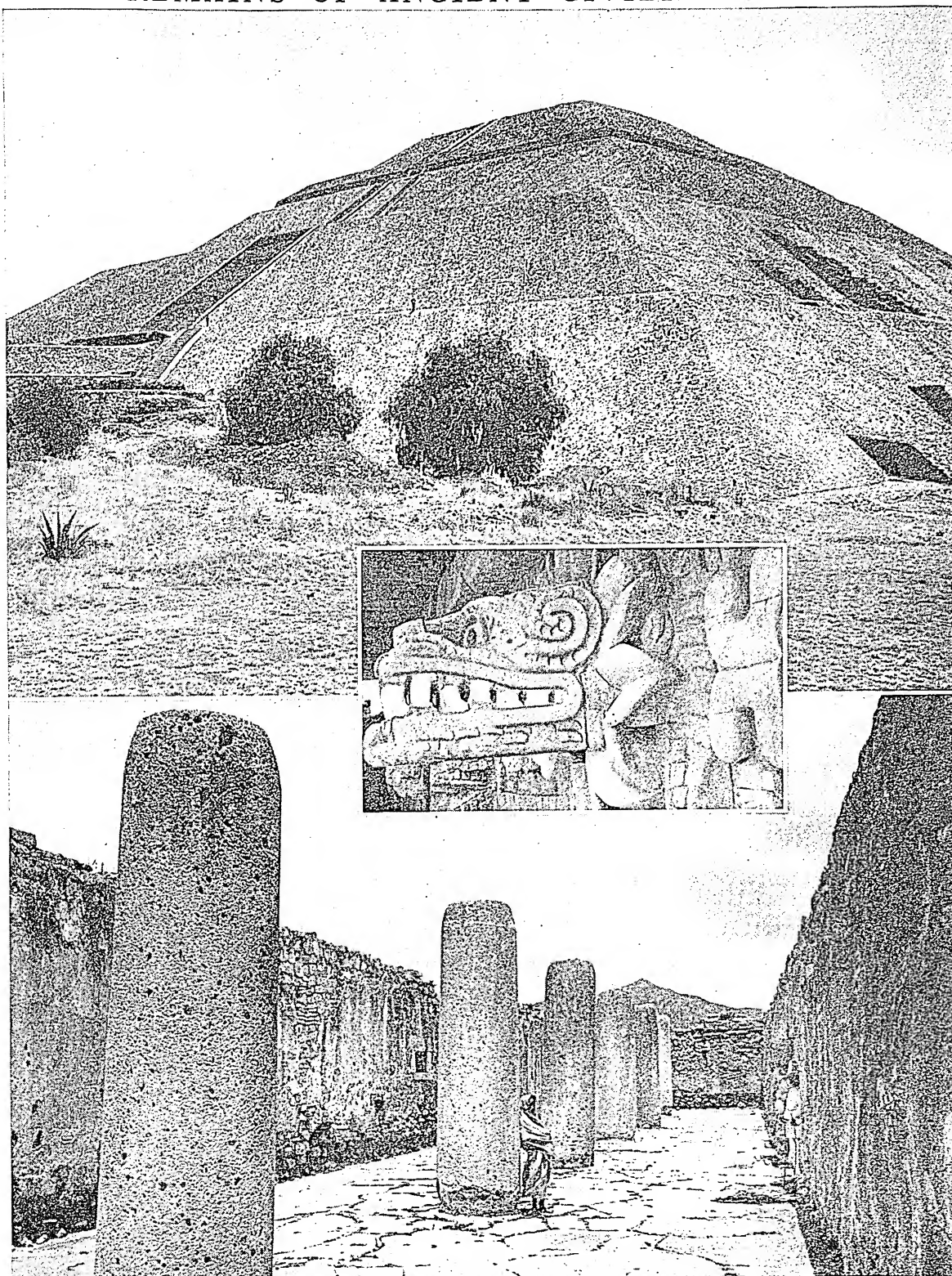
PALACE OF FINE ARTS, MEXICO CITY



This elaborate marble building, begun by President Díaz in 1900 and completed in 1934, contains a theater, art galleries, and a museum of popular arts. Its tremendous weight has made it settle six feet into the ground.



## REMAINS OF ANCIENT CIVILIZATIONS



Forty miles from Mexico City is the area known as San Juan Teotihuacán, occupying about eight square miles. Here the Pyramid of the Sun (above), 216 feet high and 720 feet square, was built by the Toltecs. On its truncated top stood a temple. Near by is the smaller Pyramid of the Moon and several temples and subterranean tomblike buildings, connected by the "Highway of the Dead." In the Temple of Quetzalcoatl the decorative frieze of feathered serpent heads (inset) has been preserved. The sacred city of the Zapotecs in southern Mexico was Mitla. The Hall of the Monoliths (below) is one of its ruins.

pyramid at Cholula near Puebla. A Catholic chapel now stands on the top, on the site of the temple to the Plumed Serpent.

Contemporary with the Toltecs were the Zapotecs, who lived in the south around modern Oaxaca. The ruins of their sacred city Mitla (*mēt'lā*) are notable for their beautiful mosaic decorations in cut stone. At Monte Alban, on the hills overlooking the valley of Oaxaca, are other extensive Zapotec ruins only partially excavated. One tomb at this site yielded a treasure of exquisite jewels of marvellous workmanship. They have been exhibited in the United States and are now in the Oaxaca museum. The jewels were left there by another shadowy people, the Mixtecs (*mīs'tēks*), who conquered the Zapotecs and for a brief time used their tombs.

#### Spanish Conquest—Then Independence

By the time of the Spanish conquest (1519), all these races had been conquered and enslaved by the Aztecs (*see* Aztecs; Cortez, Hernando). The Spanish conquest was made easy by the division among these various peoples, who were united only in their hatred of the common enemy, the Aztecs.

For three centuries Spain exploited the country. Then Napoleon's aggressions and the Peninsular War in Spain (*see* Spain) gave the Latin American colonies an opportunity to revolt. On Sept. 16, 1810, the church bells of the village of Dolores began tolling. Out of the hills poured the Indians to the call of their beloved parish priest, Father Miguel Hidalgo. "Will you be free?" he demanded of them. "Will you make the effort to recover from the hated Spaniards the lands stolen from your forefathers three hundred years ago?" Once again the struggle for *land* had begun. Hidalgo led the patriots until his capture and execution by government forces, July 1811.

His banner was taken up by José María Morelos, also a parish priest, friend and pupil of Hidalgo. A stronger leader than Hidalgo, he was more successful in battle and was able to call a national congress which on Nov. 6, 1813, formally declared the independence of Mexico from Spain. In 1815 Morelos faced a royalist firing squad. The ragged remnants of his army struggled on for six years more under Vicente Guerrero waging guerrilla warfare against the royalists.

In 1821 the revolution of the liberals in Spain gave new impetus to the Mexican movement. An ambitious royalist officer, Augustin de Iturbide, deserted and, in order to acquire an army for his own purposes, joined forces with Guerrero. He proclaimed the Plan of Iguala which provided for national independence under a constitutional monarchy. The plan won the support of the conservatives, who feared the new liberalism of the home country. Iturbide was crowned emperor of Mexico in July 1822. The empire lasted 11 months. Iturbide was dethroned, exiled to Italy, and, when he returned a few months later, was put to death.

One of the leaders in the expulsion of Iturbide was General Antonio Lopez de Santa Anna, who domi-

nated the political scene for the next 30 years. He made and unmade presidents and was himself president when Texas revolted and again when war with the United States broke out. In this war Mexico lost half its national territory (*see* Mexican War). Santa Anna's corrupt rule ended with his exile in 1855.

Fifty years of "independence" had proved a sad irony. The men who had fought for freedom had won only a new set of masters—the generals and unscrupulous politicians who served their own interests. Economically the common people were worse off than before. In 1858 a new element came to power when Benito Juárez, a full-blooded Zapotec Indian from Oaxaca, became president. He was determined to break the power of the Catholic Church in Mexico, not as a form of religion but as a political influence. By gift and inheritance the church had acquired no less than one-half of all the land and capital of the country. In 1859 Juárez issued decrees separating church and state, abolishing the monastic orders, and nationalizing all church property. It was his expectation that the lands would return to the Indians, but they were bought up by speculators.

Many years of revolution had demoralized the finances of the country. When Juárez announced a two-year suspension of payments on foreign loans in 1861, France, Great Britain, and Spain occupied Vera Cruz. Great Britain and Spain withdrew when it became apparent that the French Emperor Napoleon III was intending to overthrow the Mexican government. In the course of the struggle the French suffered a severe defeat on May 5, 1862, whence comes the national holiday known as the Cinco de Mayo (fifth of May). In 1864 France declared Mexico an empire with Maximilian I, of Austria, as emperor. This was a defiance of the Monroe Doctrine, which France would probably not have attempted had not the United States been occupied with the Civil War. At the close of the war, Gen. Philip Sheridan marched to the Rio Grande, whereupon the French troops withdrew from Mexico. Maximilian was executed June 19, 1867.

#### The Régime of Porfirio Díaz

One of the military leaders in the struggle against the French was Porfirio Díaz, a mestizo. In 1876 he overthrew the successor of Juárez and the following year secured the presidency for himself. A new era was to begin for the storm-tossed nation. Except for the years 1880 to 1884, when a man of his own choosing was president, Díaz was absolute dictator for more than three decades. On the surface it was a golden age of peace and plenty. Díaz established order and persuaded foreign capital to develop the national resources. He increased the national income from 19 to 100 million dollars; multiplied imports eight times and exports five times; increased gold and silver mining from 25 to 160 million dollars annually; and extended railway mileage from 400 to 15,000 miles.

The other side of the picture is not so attractive. There was no law but the will of Díaz. He referred to his legislature as "my herd of horses." To foreign

speculators and personal friends he gave one-fifth of the entire area of the country.

#### The Beginning of the Revolution

As the aging Díaz gradually relinquished his personal grip on public affairs, the clouds of war again began to gather. Francisco I. Madero, the son of a rich and powerful family, wrote a book entitled 'The Presidential Succession in 1910', in which he mildly criticized the Díaz régime. The book won considerable attention. Political clubs were formed and newspapers established to express his views. In 1910, following the elections, revolution broke out and Madero captured the city of Juárez on May 9, 1911. He forced Díaz to resign the presidency and was himself elected on a platform which promised the single presidential term and reforms in the suffrage, land distribution, and freedom of the press.

Madero was idealistic and sincere but a poor executive. His brief presidency was chaotic. Felix Díaz, nephew of the dictator, headed a revolt in Vera Cruz. One of Madero's generals, Victoriano Huerta, rebelled against his chief. With the assistance of Henry Lane Wilson, the American ambassador, Huerta and Díaz united to overthrow Madero and he was brutally murdered on the night of Feb. 22, 1913. Wilson was recalled by President Woodrow Wilson for his share in the affair.

Huerta now became provisional president. Counter-revolutions flared throughout the north under the leadership of Venustiano Carranza, a Madero adherent and governor of the state of Coahuila, and his generals Francisco ("Pancho") Villa, Alvaro Obregón, and Pablo Gonzáles. In the south Emiliano Zapata was leading the disillusioned peasants in raids on the sugar plantations. Up to this point the revolution had been formless and inarticulate. Leaders sprang up independently in widely separated parts of the country, gathered about them ragged unarmed peasants, and provisioned them off the country. The peasants knew only that they and their children were hungry, had been hungry always.

Zapata was the first to define the fundamental issue at stake. His war cry was "Land and Liberty," his objective the return of the haciendas to the people. He became the symbol of the revolution, the idol of the people. Innumerable tales and songs sprang up around his exploits.

Huerta regained some of his popularity in his own country when he defied the power of the United States after the so-called Tampico Incident in the spring of 1914. Sailors from the United States gunboat *Dolphin*, who had gone ashore at Tampico for supplies, were arrested by Mexican police. Admiral Mayo demanded an apology and a salute to the flag. Huerta apologized but refused to salute. The incident was used as an excuse to capture Vera

Cruz to prevent the landing of munitions for Huerta from a German steamship. War was averted by the mediation of Argentina, Brazil, and Chile.

#### Period of Disorder and Confusion

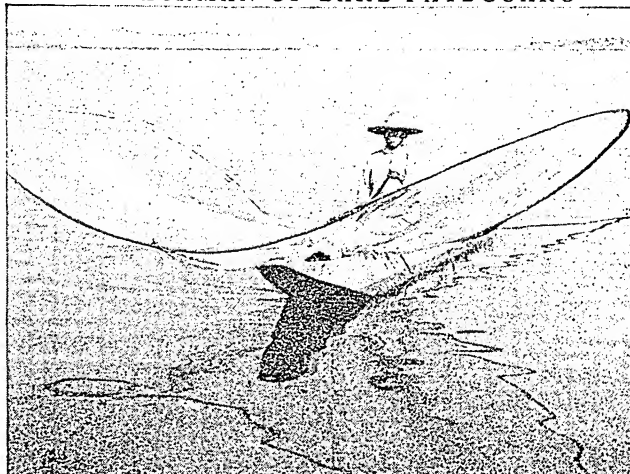
The United States, by preventing supplies from reaching Huerta and by allowing munitions to reach his enemies Carranza and Villa, succeeded in overthrowing Huerta, and Carranza became president. In the meantime Carranza and Villa had quarreled, and Villa became a rebel chieftain. In 1916 he raided Columbus, N. M., killing a number of Americans. General Pershing was sent into Mexico at the head of a punitive expedition, but Villa escaped.

After the entry of the United States into the World War of 1914-18, Mexico became a center of German intrigue. Germany even went so far as to propose, in the famous "Zimmermann note," to help Mexico invade the United States.

Under Carranza the Constitution of 1917 was adopted. Now at last the program was crystallized. The Constitution is the "blueprint"

of a modern socialistic nation. The convention that drew it up is considered by many historians the most important single event of the revolution. It sharply divides the revolution into two periods. Before 1917 it was a chaotic struggle to destroy the evils of 400 years of feudalism. Since 1917 it has been a

A FISHERMAN OF LAKE PÁTZCUARO



Fishermen on Lake Pátzcuaro use these spoon nets and simple dugout canoes. Living on the shores are Tarascan Indians.

A TYPICAL "ZAPATISTA"



Peons of the south, like this old man, fought with Emiliano Zapata.



struggle to put into effect the ideals written into the Constitution. The most important clauses, relating to land, labor, subsoil resources, and education, have already been discussed.

Carranza won many enemies by failing to push the revolutionary program, and in 1920 he was murdered. General Alvaro Obregón became president. Obregón soon proved to be the strongest man Mexico had produced since Díaz and the first who was both willing and able to put through badly needed social reforms. For eight years Obregón dominated Mexico, since his successor to the presidency, Gen. Plutarco Elias Calles, was elected by his influence and remained in political alliance with Obregón throughout his administration, 1924-28. Calles' drastic enforcement of the antichurch laws and the mineral and land laws led to widespread revolt at home and serious difficulties with foreign governments. Through the skillful diplomacy of the United States ambassador Dwight Morrow, he was persuaded to adopt a more friendly attitude toward foreign powers and to reopen the churches. The superb Diego Rivera frescoes in the Cortez Palace of Cuernavaca were commissioned by Mr. Morrow as a personal expression of his affection for Mexico. More than any other American ambassador he soothed the resentment against American interference in Mexican affairs and the still bitter memories of the Mexican War.

Obregón was again elected after Calles but was assassinated by a religious fanatic in 1928. Calles now exercised chief political power as founder and head of the strong National Revolutionary party (PNR). He brought about the election of Emilio Portes Gil as provisional president; placed Pascual Ortiz Rubio in the presidency in 1930; forced him to resign in 1932; and put Abelardo Rodriguez in his place.

#### Period of Peaceful Reforms

In 1934 he supported General Lázaro Cárdenas, a mestizo with Tarascan Indian blood. But Cárdenas was no puppet. He expelled Calles from the country and vigorously developed the Six Year Plan for socializing the nation which had been drawn up by PNR.

In six years Cárdenas distributed more land to the peasants than had been done in all the years preceding. He built up the rural schools; nationalized the oil lands held by powerful British and American interests; encouraged and strengthened the labor unions.

These reforms, however desirable in theory, caused a major economic depression. The difficulties over oil seizures cut off a major source of government revenue and forced curtailment of public works. Wages could not keep pace with the soaring cost of living, and labor suffered severely. Discontent was widespread when the 1940 elections permitted a peaceful change of power and policy.

The administration of President Manuel Avila Camacho opened with a promise of moderation and conciliation. Friendly relations with the United States were signalized by the presence of Vice-President Henry A. Wallace at the inaugural ceremonies. Settlement of the oil and land claims went far to cement relations between the two countries.

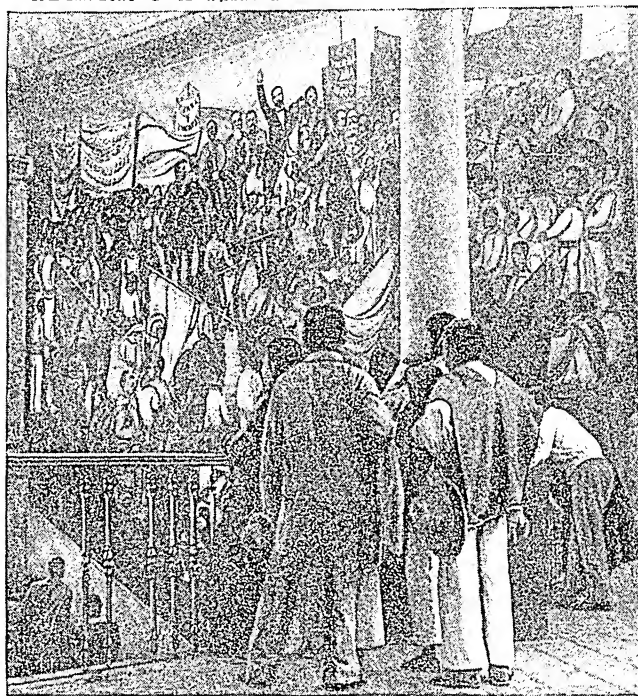
The second World War brought about increased friendliness and coöperation. At the conference of American nations at Rio de Janeiro in January 1942 Mexico, brilliantly represented by Foreign Minister Eze-

quiel Padilla, took the lead in bringing about a declaration of opposition to the Axis powers and of support for the United States. On June 1, 1942, after several Mexican ships had been sunk by Axis submarines, President Avila Camacho, with the unanimous consent of the legislature, declared war on Germany, Italy, and Japan. Thereafter, Mexico coöperated in hemisphere defense, mobilized its army, and with the aid of United States capital increased its production of raw materials vital to the war effort.

#### Organization of the Government

A federative republic, Mexico is divided into 28 states, 3 territories, and a federal district. Its president is elected for six years and cannot succeed himself. The bicameral legislature appoints a permanent committee of 14 senators and 15 deputies to serve between sessions of Congress. (See Díaz, Porfirio; Latin America; Latin American Literature; Mexico City.

ADMIRING A PAINTING OF THE REVOLUTION



This mural painting in Chapultepec Castle shows the early heroes of the revolution. On the white horse is Francisco Madero, who led the revolt against President Díaz. Behind him, with white beard, is Venustiano Carranza, one of his generals who became president of the Republic. The banners read "Land and Liberty," and "Land for All."

## —REFERENCE-OUTLINE for Organized Study of MEXICO—

IN SPITE of its vast natural wealth, Mexico is economically poor. For 300 years it was exploited and dominated by Spain, its people virtually enslaved. When it finally won independence a small educated group seized control, led the ignorant masses into revolution and counter-revolution, and plunged the struggling country into political chaos. Today, however, with increasing stability in government, much progress is being made in land distribution, industrial development, and education.

### I. PHYSIOGRAPHY: M-132a-134, M-133 map, N-151, Y-210.

- A. Mountains and Plateaus: M-132b-133, pictures M-134, M-135.
- B. Great Peninsulas: Yucatan Y-210; Lower California C-35.
- C. Isthmus of Tehuantepec: M-132b, N-151.
- D. Coastal Lowlands: M-133-4.
- E. Rivers: M-135, M-133 map. Rio Grande R-109.

### II. CLIMATE: M-134-5, C-35, Y-210. Rainfall map N-150a.

### III. NATURAL RESOURCES:

- A. Arable Land: M-139.
- B. Forests of Valuable Timber: M-140, L-180.
- C. Minerals: Rich Ore Deposits M-140-41; Vast Oil Supply M-141, P-144, P-145, P-146 map; Silver M-141.

### IV. INDUSTRIES:

- A. Agriculture: M-139-40, 134. Chief Food Crops M-139; Corn M-139; Cotton M-139, Y-210, C-379 map; Agave or Sisal Plant A-46, S-154, M-140; Timber Production M-140; Tobacco M-139; Coffee M-139; Guayule Rubber M-140, G-181d; Chicle M-140; Rubber M-140, R-163; Vanilla V-273.
- B. Stock Raising: M-140, C-103, C-107-8.
- C. Mining: M-140-42, S-152, M-188.
- D. Oil Output and Petroleum Refining: M-141-2.
- E. Manufacturing: M-142.
- F. Arts and Crafts: M-132a, pictures M-139.
- V. CHIEF CITIES: M-133. Mexico City (capital) M-144; Monterrey M-142; Puebla M-142; Orizaba M-142; Vera Cruz V-280, picture M-141; Guadalajara (Fact-Index), picture M-134; Tampico M-141; Acapulco M-134, picture M-142; Manzanillo M-134; Mazatlán M-134.

### VI. PEOPLES OF MEXICO: M-135-9, L-67f, A-149.

- A. First Inhabitants: M-135, M-142b-d, A-149. Aztecs A-408-10, A-147-8, picture E-163; Mayas Y-210, A-147-8, 149, picture E-345, W-185; Toltecs M-142b-d, A-147-8, 149; Zapotecs and Mixtecs M-142d, picture M-142c.
- B. Invasion by Spaniards: C-372, M-142d, M-135, L-67e.
- C. Present Mestizo Population: M-135, L-67f.
- D. Immigration and Emigration: M-136, I-24.
- E. Population: Birth and Death Rate M-136, pictograph P-304b; Density map N-150a.

### VII. TRANSPORTATION: M-142, R-114.

### VIII. SOCIAL PROBLEMS:

- A. Land Ownership: M-140, L-67g.
- B. Foreign Ownership of Resources: M-141-2, L-67n-o.
- C. Labor: M-142-142a.
- D. Education: M-142a-b.

### IX. HIGH LIGHTS IN MEXICO'S HISTORY:

- A. Aboriginal Mexico (Prehistoric to Spanish Conquest): M-142b-d.
- B. Spanish Conquest and Occupation (1521 to 1821):
  - a. Montezuma, Emperor of Aztecs: A-408, C-372.
  - b. Cortez' Conquest of Mexico: C-372-3.
  - c. De Niza Enters New Mexico from Mexico: N-99.
  - d. Coronado Journeys North into the Present United States: A-144, C-370.
  - e. Settlements in California, Arizona, New Mexico: C-32, A-290, N-99, S-221.

### C. Beginning of Mexican National Period:

- a. Hidalgo's Revolt against Spain: M-142d, L-67h-i.
- b. Iturbide Proclaims Freedom from Spain: M-142d.
- c. Santa Anna 30 Years a Dictator M-142d, T-60.
- d. Texas Asserts Independence: H-346, C-398, T-60.

### D. War with United States (1846-47):

- a. Boundary Dispute Cause of War: M-131, P-296, T-20, U-241-2.
- b. Americans Capture Mexico City: M-132, M-145, S-51.
- c. Mexico Loses Rich Territory: California C-33-4, S-1, S-26, L-199; New Mexico N-99, M-131; Part of Arizona A-290, 292; Utah U-266, P-296.
- d. Gadsden Purchase: U-241-2, P-214.

### E. France Attempts to Establish an Empire in Mexico:

- a. Attacks Juárez Administration: M-142d.
- b. Makes Maximilian Emperor: M-142d, N-11.
- c. United States Forces Out French: M-142d, M-241, J-224.

### F. Mexico Enters on New Era of Progress:

- a. Juárez Becomes President (1858): M-142d.
- b. Díaz Overthrows Juárez' Successor (1876): D-64, M-142d.

### G. The Revolution of 1910:

- a. Madero Deposes Díaz: M-142e, W-108.
- b. Huerta Becomes President: M-142e.
- c. United States Refuses to Recognize Huerta: W-108, M-142e.
- d. Tampico Incident (1914): M-142e, V-280.
- e. Carranza Heads New Revolt: M-142e.
- f. Villa Raids American Territory (1916): M-142e.

### H. More Stable Government Is Formed:

- a. The 1917 Constitution: M-142e-f, M-140, M-141, M-142, M-142a.
- b. Obregón Becomes President (1920): M-142f.
- c. Dwight Morrow Better United States-Mexico Relations: M-142f, L-67b.
- d. Calles Leadership: M-142f.
- e. The Six-Year Plan under Cárdenas: M-142f, M-140, M-141-2, M-142a.
- f. Avila Camacho Becomes President: M-142f.
- g. Entrance into Second World War: M-142f.

### X. CULTURAL ACHIEVEMENTS:

- A. Literature: L-67w, L-67b, L-67h, L-67j.
- B. Painting: M-142b, L-67k.
- C. Music: M-142b, L-67k.
- D. Motion Pictures: M-142b.
- E. Education: M-142a-b.

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**MEXICO CITY, MEXICO.** The capital of Mexico is the oldest city in North America, for it is a continuation of the Aztec city of Tenochtitlán, founded about 1325 (see Aztecs). Like Washington, D.C., it is included in a federal district (*Distrito Federal*) and is identified officially as Mexico, D.F.

The city lies in a fertile valley 7,500 feet above sea level. Visible to the southeast are the snow-crowned peaks of Popocatepetl and Ixtaccihuatl. East of the city stretches a flat plain, once the bed of numerous lakes. Rivers flowing into these lakes used to cause disastrous floods, for the Valley of Mexico had no natural outlet to the sea. In 1900 the great 30-mile Canal del Desagüe was cut through the mountains on the north to a headstream of the Pánuco River. This canal with its many branches now drains the lake area into the Gulf of Mexico and removes the sewage of the city. All that remains are the shallow water flats of Lake Texcoco on the east, and Lake Xochimilco. The old lake beds are devoted to truck gardening and the raising of dairy cattle, and the canals carry the small flat-bottomed boats of the produce merchants and the Sunday picnickers.

Mexico City's high altitude offsets its tropical location and gives it a mild and uniform climate. The rainy season from June to November is not unpleasant, for the rains usually occur in late afternoon and evening in downpours of short duration.

#### Historic Heart of the City

The nucleus of the city is the Plaza Mayor de la Constitución, popularly called the Zócalo. Here are the splendid public buildings—the Cathedral, the National Palace, the Municipal Palace, and the Arcades of the Tradesmen—all built shortly after the conquest in the 16th century on the site of the Aztec temples and palaces. At the northeast corner of the square in a deep excavation may be seen a section of the foundations of the Aztec Teocalli, a pyramid with decorations of huge stone dragon heads. Attached to the National Palace is the National Museum, a treasure house of Mexican archeology. One of its most precious relics is the Aztec Calendar Stone

(see Aztecs). This old part of the city around the Zócalo has many beautiful buildings and churches of colonial Spanish architecture. Near by, too, is the modern Ministry of Education, famous for its mural paintings by Diego Rivera, and the National Preparatory School with murals by José Clemente Orozco.

West of the Zócalo, in the heart of the business district, is the Alameda, a large plaza flanked by the ornate white marble Palace of Fine Arts and by modern skyscrapers. A few blocks west of the Alameda is the Monument to the Revolution. The monument is a massive structure, 250 feet high, of marble and stone arches supporting a copper dome. On the corners of the arches below the dome are allegorical sculptures representing the labor, reform, and agrarian laws, and independence.

#### Paseo de la Reforma and Chapultepec

Near the monument begins the beautiful Paseo de la Reforma, a broad tree-lined avenue which sweeps in a straight line three miles southwest to Chapultepec Park. It was planned by Emperor Maximilian to resemble the Champs Elysées in Paris. At intervals along the way are circles containing gardens, fountains, and monuments. Chapultepec was a pleasure park in the days of the Aztec Montezuma. Moss-covered *ahuehuetes*, giant cypress trees hundreds of years old, line the many walks and drives. On Sundays the park is filled with families who bring their lunches and listen to the concerts by the *Orquesta Típica* and watch the performances of the *charros*. These are men who dress in traditional costume and give demonstrations of riding skill on superbly trained horses. They are members of an exclusive club whose purpose is to keep alive the dress and customs of an earlier day. Chapultepec Castle surmounts a hill in the park. (See also Mexican War; Mexico).

The city is growing rapidly and suburbs of doubtful architectural merit reach out in all directions. Many of the adobe hovels of the laboring people are being replaced by government-built small apartments. Industries are increasing in number and importance, and the development of electric power within recent years

#### IN THE HEART OF MEXICO CITY



The Plaza Mayor de la Constitución, better known as the Zócalo, is the historic heart of the city. At the right stands the cathedral on foundations laid in 1573. It occupies the site of a great Aztec pyramid and temple, the Teocalli, where human sacrifices were offered. This picture was made from the National Palace, which flanks the entire east side of the square. It houses the government offices. Over its main gateway is the "Liberty Bell" of Mexico, first rung Sept. 16, 1810, by Miguel Hidalgo, who led the revolt that ended in the overthrow of Spanish rule. On every anniversary of this event, at midnight, the bell is rung by the president.



has helped manufacturing. Among the leading products are textiles, leather, boots and shoes, paper, pottery, tobacco, soap, liquor, flour, and furniture.

Mexico City was founded about 1325 by the Aztecs, who built a village of mud and rush dwellings on little islets in Lake Texcoco. First called Tenochtitlan, and later named Mexitli in honor of the god of war, it grew with the increasing power and civilization of its inhabitants. In the 15th century the rude dwellings were replaced by stone structures. The town had reached the height of its glory when the Spaniards under Cortez practically destroyed it in 1521. It was rebuilt by natives under the direction of the conqueror. In the Mexican War of 1846-48, it was captured by the United States troops under Gen. Winfield Scott, and was held until the signing of the armistice. Population, more than 1,000,000.

**MIAMI, FLA.** The enterprising H. M. Flagler in 1896 extended the East Coast Railway down to an old Indian trading post squatted at the edge of a mangrove swamp on Biscayne Bay at the southern tip of Florida. Next to the little Indian storehouse he built the Royal Palm Hotel, and almost overnight the magic city of Miami grew up. In 1925 and 1926, during the Florida real estate boom Miami's population almost doubled. Skyscrapers and huge hotels sprang up with bewildering speed. Although a tremendous hurricane swept through the city in 1926, wrecking new homes and buildings and destroying property worth millions of dollars, all its traces were soon erased.

Its warm subtropical climate has made Miami a world-famed winter playground, and the tourist trade yields a large annual income. Every facility is offered for golfing, yachting, fishing, bathing, polo, and other sports. Sailfish, tarpon, and many other game fish try the skill of fishermen. Three causeways across Biscayne Bay connect the city with Miami Beach, which stretches for eight miles along the ocean. On the 15-mile palm-fringed boulevard that parallels the bay is beautiful Bay Front Park, with its huge amphitheater. The University of Miami, opened in 1926, has an attractive setting in Coral Gables.

#### Fish, Fruit, and Manufactures

Miami has large commercial fisheries and rapidly growing manufactures. Boatbuilding, lumber industries, foundries, glass works, dredging, paint manufactures, grapefruit canning, and tanning of snake and alligator skins keep its workers busy. The city ships large quantities of tropical and subtropical fruits—grapefruit, oranges, pineapples, limes, guavas, avocados, mangoes, coconuts—and early vegetables.

It is a busy international airport with daily or bi-weekly service to Latin American ports, and an important seaport with a fine improved harbor. A canal

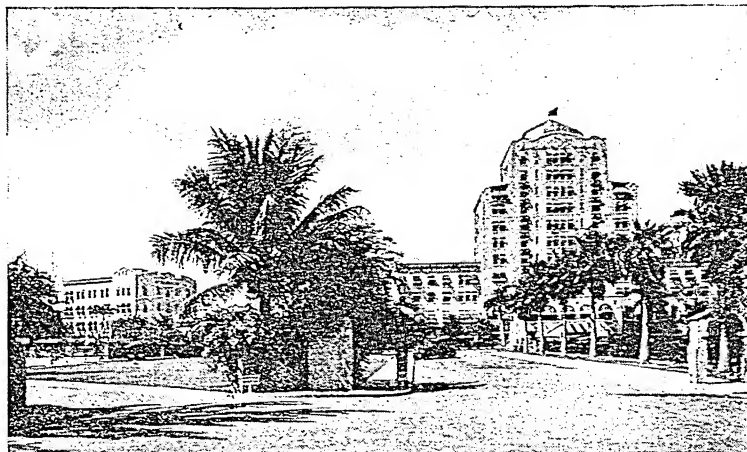
from Miami River to Lake Okeechobee gives Miami an inland waterway through the rich fruit and vegetable growing regions of the reclaimed Everglades. It is also on the Intracoastal Waterway, an inland channel along the east coast of the state, and is linked with Tampa by the Tamiami Trail, a highway which crosses the vast Everglades. Two railroads, the East Coast and the Seaboard Air Line, serve the city. Population (1940 census), 172,172.

**MICA.** A piece of this mineral an inch thick can be split into nearly a thousand sheets, each as thin as the thinnest tissue paper. For its familiar use in the doors of stoves and as chimneys for incandescent gas-burners, it is split into sheets about as thick as heavy paper. These sheets are tough, elastic, and resistant to heat, and those made from the variety of mica called "muscovite" are almost as transparent as glass. The name muscovite, or muscovy glass as it used to be called, came from the fact that this mica was formerly in common use for windows in Russia.

The chief use of mica today is as a dielectric in small electrical condensers, such as are used in radio apparatus (see Electricity). Broken into small sparkling bits it is used as "spangles" to give glittering effects to stage costumes and scenery. This use recalls the origin of the word mica, which comes from the Latin word *micare* meaning "to glitter."

All the varieties of mica are silicates of aluminum and other elements, that is, are compounds of silicon and aluminum with other things in minor quantities. Muscovite also contains potassium. Most of the world's supply of sheet mica comes from India, but the United States and Canada furnish most of the

ON THE SHORE OF BISCAYNE BAY



One of the palm-lined drives that give Miami and its sister city, Miami Beach, their pleasant semitropical atmosphere. In the background is a good example of the architecture that is popular throughout Florida.

"scrap" mica. In North Carolina, the richest field in the United States, much of the mining is done in primitive fashion by farmers, who trade it to the storekeepers. New Hampshire also has valuable mica lands in the White Mountains. Mica is found in shades of yellow, green, brown, red, and black.

# MASTER GENIUS *of the* RENAISSANCE

**MICHELANGELO**  
(*mī'kēl-ān'jē-lō*)  
**BUONARROTI** (1475-1564). On a scaffolding sixty feet above the floor of a chapel in Rome lay a man, painting with furious strokes on the wet plaster of the ceiling which stretched its ten thousand square feet of surface about him. It was Michelangelo, the greatest genius of the Italian Renaissance, who between the years 1508 and 1512 frescoed the vault of the Sistine Chapel with hundreds of titanic figures embodying his vision of the world's creation.

Today we gaze in awe at the nine main scenes depicting the story of Genesis from the Creation to the Flood. We see many other scenes showing the ancestry of Christ, stirring moments of Biblical history, and the ancient prophets and the pagan sibyls dreaming of the good that was to come to the world.

When we consider the vast size of this enormous mural, its majestic vigor and variety, and the stupendous difficulties of the task, we are

astounded to think that it could have been accomplished by the almost unaided powers of one man. We understand why artists call this "the most extraordinary piece of technical work ever accomplished."

Not only are we thrilled by Michelangelo's lofty conception and by his masterly technique, but we are also stirred by his indomitable will and almost superhuman energy. We marvel at the courage with which he bore the "great hardships, illness, and overwhelming labor" that accompanied this work. His difficulties were extraordinary. The huge figures had to be painted while he sat or lay in so cramped a posi-



The majestic 'Moses', in the Church of San Pietro in Vincoli, Rome, is generally agreed to be Michelangelo's masterpiece. The Lawgiver, with the tablets of the Law by his side, is represented at the moment when he sees the people of Israel dancing around the Golden Calf. Wrath, indignation, and pain are frozen on his face.

tion that for months afterward he could not read "except in the same attitude of looking upwards." The assistants whom he engaged were unequal to the task of carrying out his designs, and he had to carry out the whole vast design with his own hand. To the difficulties of the work itself were added harassing worries caused by intriguing rivals, money troubles, and the constant demands of his grasping brothers.

When we think of these difficulties we marvel how anyone could have surmounted them and created this perfect work. In it, as a great critic says, "the artist's spirit appears at its noblest dignity, in its highest purity."

The Buonarroti were a poor but noble family of Florence. Michelangelo was born March 6, 1475, at Caprese, a small town of which his father was then mayor.

The boy grew up in Florence, which was the art capital of Italy, and early showed a great fondness and talent for art. He spent all his leisure in

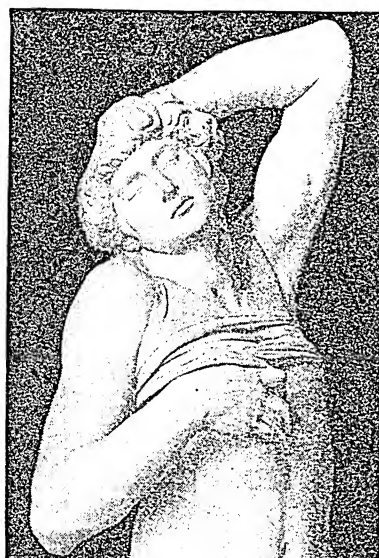
drawing and painting and was so set on becoming an artist that his father was forced, against his will, to apprentice him to the painter Ghirlandaio.

Michelangelo was then only 13, but his work was so promising that within a year he was chosen for admittance to the new art school established by Lorenzo de' Medici in the Medici gardens. Here, amid Lorenzo's collection of Greek and Roman statues, Michelangelo learned the art of sculpture. He copied the head of a laughing faun with such skill that his patron took him to live in the palace. For three years, until Lorenzo's death, the youth worked untiringly, producing some fine pieces which are still preserved.

# MASTERPIECES OF MICHELANGELO, "THE FURIOUS"

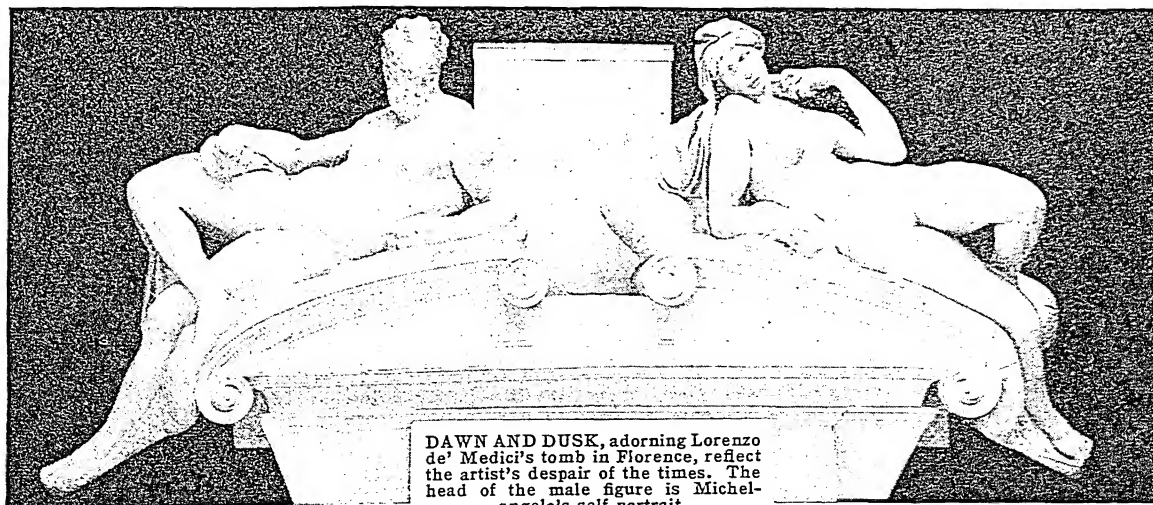


THE CREATION OF ADAM (above), in the Sistine Chapel of the Vatican. The artist lay on his back to do these ceiling paintings, which represent the story of Genesis from the Creation to the Flood. This ceiling, the most famous of all Michelangelo's paintings, cost him four and a half years of the most trying and difficult labor.



THE DYING SLAVE (above), now in the Louvre, is one of three completed marbles intended for the monument of Pope Julius II. Political changes put a stop to the work.

THE HOLY FAMILY (right), in the Uffizi at Florence. One of his early works, this is the only known easel painting by Michelangelo left in the world today. While more conventional than his later work, it manifests the same strength, and that power of showing much action in little space, which later made him known as "The Furious." In one of his later sculptures (below), this "tempest of the spirit" is again shown in the despair, the disturbed wrath, of the drowsing figures.



DAWN AND DUSK, adorning Lorenzo de' Medici's tomb in Florence, reflect the artist's despair of the times. The head of the male figure is Michelangelo's self-portrait.



Two years later he was in Rome, where he was commissioned to carve a *Pietà*, a marble group representing the Virgin Mary supporting the dead Christ on her knees. This masterly group, known as 'The Madonna della Pietà', won him instant recognition as the greatest sculptor of his time.

Returning to Florence at the age of 26, Michelangelo was commissioned to make a giant statue out of an 18-foot marble block which another sculptor had clumsily roughed out years earlier and then abandoned in despair. For more than two years Michelangelo

## THE MADONNA DELLA PIETÀ

labored continuously in a wooden shed built around this block. Out of its colossal mass, with all the limitations of its previous shaping, he hewed his youthful courageous 'David'—one of the world's greatest statues, of "spirit-quailing, awe-inspiring force."

The year 1505 found Michelangelo again in Rome, this time at work on a tomb for Pope Julius II. It was to be a huge structure with some forty statues arranged in three tiers. The artist threw himself heart and soul into the great scheme, even spending many months in the Carrara marble quarries to choose the material. But new orders from the pope, political upheavals, jealousies, and changes of plan after the pope's death interfered with the work. In the end, forty years later, Michelangelo had completed only a few figures for the much reduced tomb. Among them were the majestic 'Moses', which is part of the memorial as it appears today, and the 'Slaves', now in the Louvre.

By common consent, these are among the supreme triumphs of the sculptor's art. With them rank the figures of Dawn and Dusk, Night and Day, and the portrait statues which Michelangelo did for the Medici monument in Florence.

More than 20 years after he did his ceiling frescoes for the Sistine Chapel, Michelangelo began to paint his enormous 'Last Judgment', sixty feet in height, on

the wall of the chapel behind the altar. In its vast proportions, technical excellence, and daring conception it is a fitting companion for the ceiling paintings. It has been called the most famous single picture in the world.

Besides these masterpieces, Michelangelo left the world many other significant works in both painting and sculpture. Nor did these twin arts absorb all his many-sided genius, for Michelangelo used his vast powers in many fields. When his beloved Florence was in danger, he superintended its fortification. He

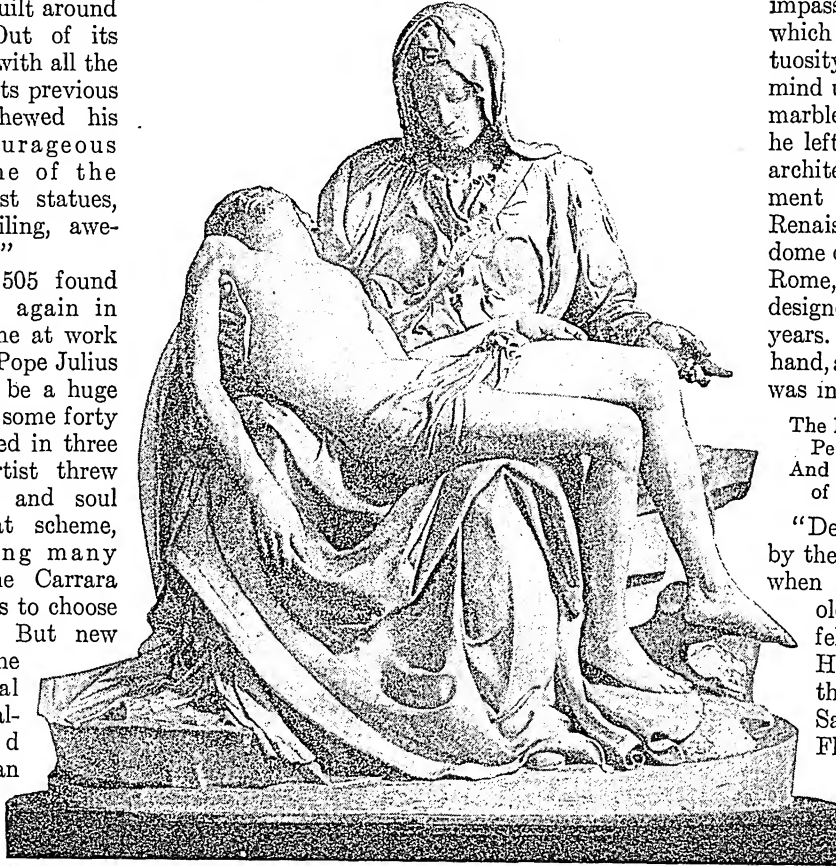
wrote a collection of impassioned sonnets which in their impetuosity and vigor remind us of his work in marble. And, finally, he left us the greatest architectural achievement of the Italian Renaissance, the great dome of St. Peter's in Rome, a labor of love designed during his last years. Michelangelo's hand, as Emerson says, was indeed—

The hand that rounded  
Peter's dome  
And groined the aisles  
of sacred Rome.

"Death plucks me by the cloak," he cried when he was 89 years old, and the brush fell from his hand. He was buried in the church of Sante Croce at Florence.

Honored as "more than mortal, angel divine," Michelangelo outlived his illustrious

contemporaries Raphael, Leonardo da Vinci, and Correggio. Except for Titian, he was the last great figure of Italy's golden age of art. A stern and lonely dreamer, in the loftiness of his inspiration and in the number and variety of his immortal works Michelangelo still stands unrivaled. He is the best type of the universal genius which the Italian Renaissance produced beyond any other epoch in the world's history (see Renaissance). In him were summed up the vigor of mind and body, the restless energy, the boldness of spirit, the freedom of action and expression, the curious combination of worldliness and religious zeal, which marked that great period.



This *Pietà*, which stands in the Church of St. Peter, Rome, was the greatest work of Michelangelo's early youth and won him instant fame as the first sculptor of his day. As an old biographer says, it is "of so great and rare a beauty, that no one beholds it but is moved to pity." It is the only work on which Michelangelo left his name.

**MICHELSON** (*mī'kəl-sŏn*), ALBERT A. (1852–1931). A class in physics at the United States Naval Academy gathered around a youthful teacher one day back in the 1870's. His simple apparatus consisted of odds and ends salvaged from a laboratory junk heap, with a small revolving mirror purchased for ten dollars. With this crude equipment the instructor conducted the experiment which resulted in the most accurate measurement made up to that time of the velocity of light. The instructor was Albert A. Michelson, who became one of the greatest physicists of all time and won world fame for his study of light and for his experiments bearing on the existence or non-existence of ether in space.

The invention of the Michelson interferometer, and of the echelon spectroscope, which gives immensely detailed spectrums (*see Spectrum and Spectroscope*); the first accurate measurement of the rigidity of the earth; and the measurement of the diameter of stars with the interferometer, were among his other notable achievements.

Michelson was born Dec. 19, 1852, in the Prussian town of Strelno. When two years old, he was brought to America by his parents, who journeyed across the western prairies to Virginia City, Nev., in a covered wagon, and a few years later moved on to San Francisco. His father decided that after his graduation from a San Francisco high school young Albert should go to Annapolis and become a naval officer. The 17-year-old boy went to Washington and persuaded President Grant to give him a special appointment to the Academy. He was graduated in 1873, then served two years as a midshipman. In 1875 he was made instructor of physics and chemistry at the Academy.

Michelson's measurement of the speed of light corrected the careful determinations made by the learned French physicists, Fizeau and Foucault. Stimulated by this success, he went to Europe to study physics for two years at Berlin, Heidelberg, and Paris. Returning to America, he became professor of physics at the Case School of Applied Science in Cleveland, Ohio. There he invented the Michelson interferometer, an instrument by which light waves may be measured to within a millionth of an inch (*see Light*). With this new instrument and in collaboration with E. W. Morley, he conducted the famous Michelson-Morley experiment on ether-drift, to determine the absolute speed of the earth in respect to the ether—the hypothetical stuff physicists believed pervaded all space.

The test was made by sending out simultaneously two beams of light—one in the direction of the earth's

motion, and the other at right angles to the path of the first light wave—and by means of mirrors, reflecting each of the beams back along its own path to the starting point. The presence of ether-drift would have slowed up the beam moving in the direction of the earth's motion so that the waves of the two beams would return somewhat out of step with each other; but the beams sent out by Michelson and Morley came back exactly in step, indicating that there was no ether-drift, and, perhaps, no ether (*see Ether*.)

The negative result of this experiment opened the way for new conceptions in physics, which resulted in the celebrated Einstein theory of relativity. Its importance is ranked with the experiment of Galileo when he dropped the stones from Pisa's leaning tower.

In 1889 Michelson became professor of physics at Clark University, in Worcester, Mass., where he further developed the application

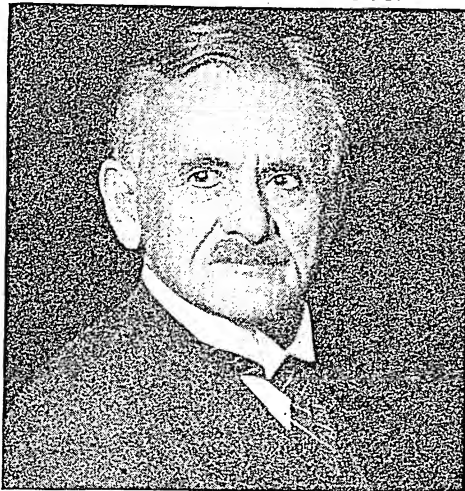
of the interferometer in the measurement of distances. Three years later he was invited to carry on his work at the International Bureau of Weights and Measures at Sèvres, France, to the end of determining the length of the standard meter in terms of the wave length of light. After one year of careful observation and experimentation, Michelson found this platinum-iridium stick to be equal to 1,553,163.5 times the wave length of a certain red line in the spectrum of the metal cadmium, with an absolute accuracy of one part in 2,000,000. If the standard meter is ever lost or

destroyed, it can now easily be reproduced, since the length of light waves is constant.

In 1892 Michelson was made head of the department and professor of physics at the University of Chicago, remaining there until 1929, when he retired to check again the speed of light. His experiment of 1926, made by racing a beam of light from the top of Mt. Wilson to San Antonio Peak in California, a distance of 22 miles, gave 186,284 miles per second as the speed. Michelson wanted still greater accuracy. When his instruments were in place and the first tests started in a mile-long vacuum tube near Pasadena, Michelson was stricken by paralysis. He directed further work, however, through assistants, until he died May 9, 1931. The final results of the experiment were published in 1936 (*see Light*).

Michelson received honorary degrees from many universities of both Europe and America, and in 1907 he won the Nobel prize for physics, the first American to receive this honor. That same year he was awarded the Copley Medal, the most distinguished honor bestowed by the Royal Society of Great Britain.

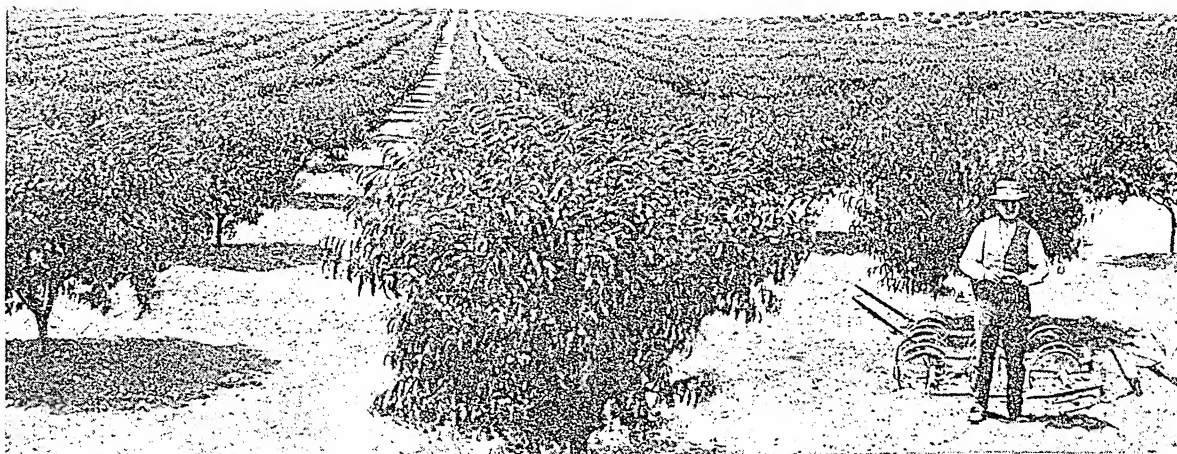
ALBERT A. MICHELSON



One of America's Greatest Physicists

## The "WOLVERINE STATE"

### *with Its Twin Peninsulas*



Here is one of the famous peach orchards in the western part of lower Michigan. The sandy soil and moderate climate are ideal for the production of fine fruit crops, and every summer this district ships enormous quantities to market by rail and water. Thus the region which once was regarded as hopeless for agricultural purposes has been turned into a paradise of flourishing orchards.

**M**ICHIGAN. If you were asked to name the states of the Union which have the longest coast lines, you would probably think only of the states that border on the ocean. But the coast line of the inland state of Michigan ranks second in length, stretching for 2,391 miles along the Great Lakes. The coast line of Florida (3,751 miles long) has the distinction of being longest, and California comes third with a coast line of 1,555 miles.

The "Wolverine State" owes its enormous coast line to the fact that it consists of two entirely distinct peninsulas which divide what would otherwise be one great inland sea into Lakes Michigan, Superior, and Huron. And so the great seal of the state bears a Latin inscription which means, "If you seek a beautiful peninsula, look about you."

It was an accident of history that the two peninsulas, which are very different in character and entirely separated by water, should be united into one state. Michigan included originally only the lower peninsula. At the time of its admission to the Union as a state in 1837, it was hotly disputing with Ohio the location of the southern boundary; so when Congress decided in favor of Ohio, the upper peninsula was awarded to Michigan in compensation for the loss.

The immense mineral wealth of the new region was then unknown, and because of its rugged rocky character people thought it was of little value. In Congress Henry Clay opposed the project for the construction

**Extent.**—Northern peninsula, north to south, 120 miles; east to west, 355 miles. Southern peninsula, north to south, 285 miles; east to west, about 200 miles. Area, 58,216 square miles, excluding 38,575 square miles of water surface of Great Lakes, within the state boundaries. Coast line on Great Lakes, 2,391 miles. Population (1940 census), 5,256,106.

**Natural Features.**—Northern peninsula, rugged and hilly; Porcupine Mountains in west on Lake Superior (highest point, 2,023 feet); low limestone and sandstone tablelands in south and northwest. Southern peninsula, broad tableland in north bordered by gentle slopes, giving way to low level or slightly rolling country (highest point, more than 1,700 feet). Numerous small rivers and lakes. Mean annual temperature, 45°; mean annual precipitation, 31".

**Products.**—Hay, corn, oats, wheat, beans, sugar beets, potatoes and other vegetables, fruit; cattle, milk, hogs, poultry and eggs; iron, copper, petroleum, salt, cement; automobiles, food, iron and steel, furniture, other lumber products, chemicals, drugs.

**Cities.**—Detroit (1,623,452), Grand Rapids (164,292), Flint (151,543), Saginaw (82,794), Lansing (capital, 78,753).

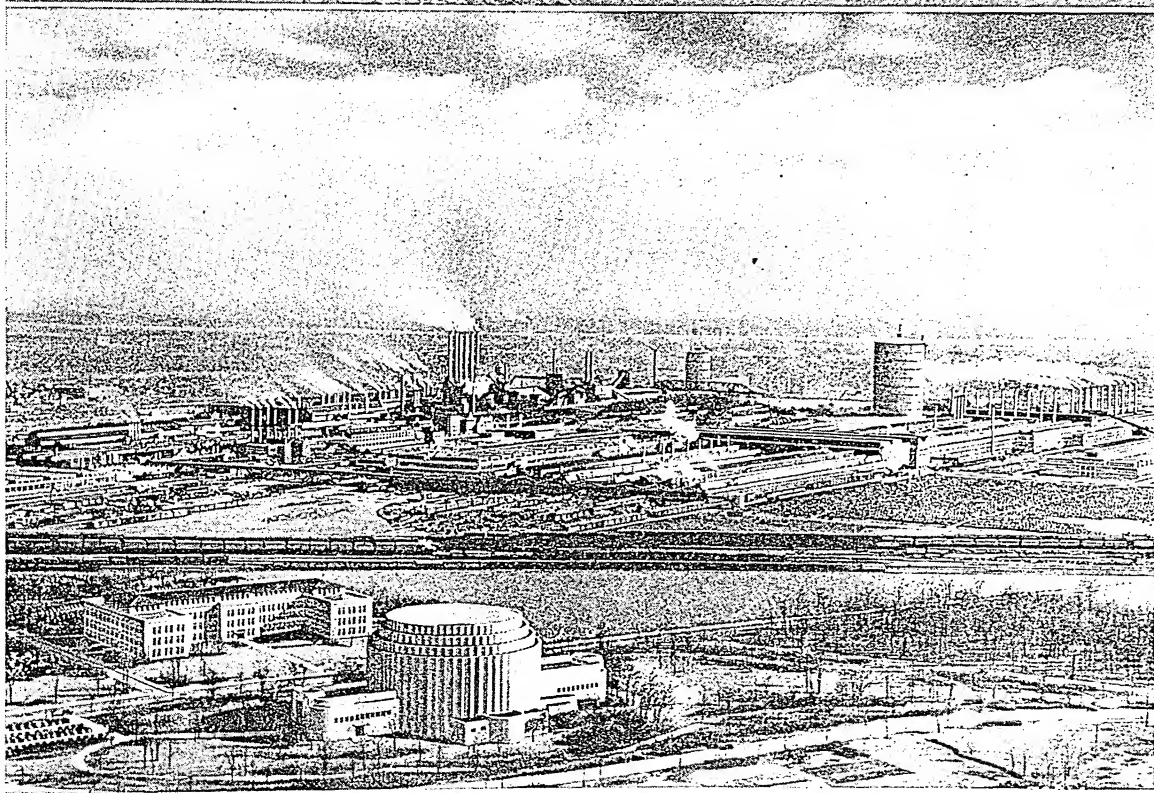
of the "Soo" canal at the point where St. Marys River separates the upper peninsula from Canada, saying that these straits were "beyond the remotest settlement in the United States, if not in the moon." Today the canals around the rapids of the "Soo" carry more traffic than the Panama

and Suez canals combined, and the upper peninsula is one of Michigan's greatest sources of wealth, for it is part of the rich Lake Superior iron and copper country, which is divided between Michigan, Wisconsin, and Minnesota. The copper deposits, which lie wholly in Michigan territory, are unique in that they are the only large deposits in the United States where copper occurs chiefly in pure metallic form. For many years Michigan was the greatest copper-producing state, but it now usually ranks after Arizona, Montana, and Utah. In the production of iron ore Michigan is surpassed only by Minnesota. The timber resources of the upper peninsula have also contributed enormously to Michigan's wealth.

The gently rolling lower peninsula, which projects north between Lakes Huron and Michigan in the shape of a gigantic hand, can boast of resources no less great, though of a different kind. Here are rich farm and fruit lands, which form the state's chief source of wealth; here are the nation's greatest salt wells; here, too, are great deposits of limestone, clay, sand, gravel, and gypsum. There is some coal, but production is inconsiderable. Petroleum, brought in near Muskegon

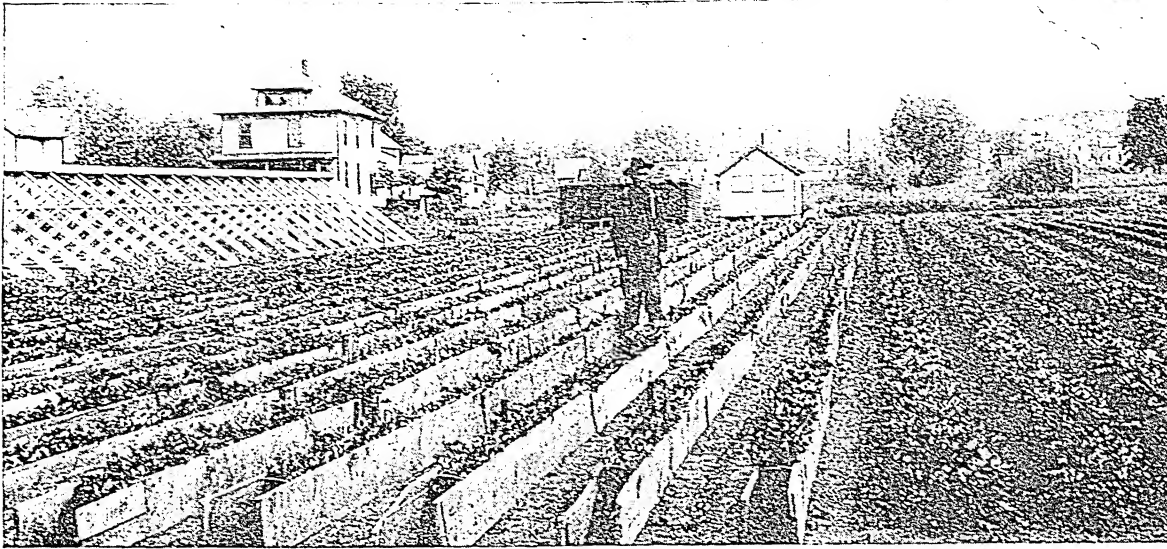


## THE WEALTH OF FARM AND FACTORY



To create the farm lands of the Upper Peninsula, dense forest had to be cut down and swamps drained. Large timberlands still remain. The flat fields above, once the bed of the prehistoric Great Lakes, are now planted to hay, oats, barley, and potatoes. Below is the River Rouge plant of the Ford Motor Company, at Dearborn, which has helped to make Michigan the world's greatest manufacturer of automobiles. The cylindrical building in the foreground, the Rotunda, houses a theater and exhibition hall. Facing it is the Ford Administration Building. (Upper view by Fairchild Aerial Surveys, Inc.)

## IN MICHIGAN'S FAMOUS CELERY DISTRICT



Celery is here being prepared for market on one of the farms near Kalamazoo. In its natural state celery is bitter, tough, and unsuitable for food. This condition was remedied in earlier days by banking the rows with earth. The stalks then turned white and acquired the flavor we all know. Now the celery growers save themselves much of this trouble, for they have found that closely packed plants will blanch themselves without earth, if properly confined between planks as is being done at the left of the picture. The process of blanching not only turns the stalks white, but makes them tender and crisp.

in 1929, has since become one of the state's most important minerals. Along Lake Michigan is a fruit belt, some 30 miles wide, where apples, peaches, pears, plums, cherries, grapes, and small fruits are grown in abundance, thanks to the prevailing westerly winds from across the lake. By lengthening the cold season these winds tend to prevent early budding of the fruit trees and the consequent danger of destruction of the crop by late spring frosts, and by similarly prolonging the warm season they give the fruits plenty of time to ripen.

The farm lands produce large crops of corn, wheat, oats, hay, sugar beets, beans, peas, and potatoes. The Michigan celery beds are famous through the nation, and the state is one of the chief sources of supply for peppermint, used in chewing-gum and for other flavoring. It is also one of the leading states in beet-sugar making and sheep raising.

A generation ago Michigan was the chief lumber state in the Union, but this industry has greatly declined, as the forests of both hard and soft woods were cut wastefully without regard for the future. Cities like Saginaw, which owed their rise to the lumber industry, have become general manufacturing

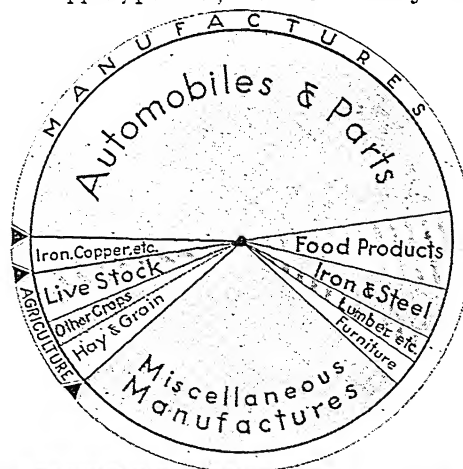
centers. Large forest reserves, however, have been set aside, and it is expected that within a few years the timber industry can be partially revived.

These vast resources of minerals and lumber, combined with the cheap transportation afforded by the Great Lakes, have made Michigan one of the great manufacturing states. The automobile industry leads all the rest. Nearly one-half of the automobile output of the country comes from this state, and Detroit is the automobile capital of the world (see Detroit). Flint, Lansing (the state capital), Pontiac, and Jackson are all important seats of automobile manufacture. The man-

ufactures of steel, rolling-mill, and foundry products—the second most important industry—supply much of the steel needed for

motor vehicles. The steel mills are in the southeastern part of the state on Lake Erie and the Detroit River, near the automobile factories.

From the once tremendous lumber resources developed the third important group of manufactures—furniture, paper, pulp, wooden and paper boxes, and other lumber and timber products. Grand Rapids is one of the most celebrated furniture centers of the world (see Grand Rapids). Michigan is a leading state in the



AGRICULTURE	MANUFACTURING	TRADE & TRANSPORTATION	OTHER OCCUPATIONS
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Michigan's manufactures are its chief source of wealth, as this chart clearly shows. The chief occupations are compared below.

production of drugs, medicines, and chemicals. It owes this distinction largely to the fact that important chemicals are obtained from the salt deposits. Flour and gristmill products are extensively manufactured in the southwestern part of the lower peninsula. The breakfast foods and other cereal preparations of Battle Creek are known all over the world. Supplies of tanbark and nearness to Chicago and other cattle and hide markets have made possible a large and profitable leather manufacturing industry. Boots and shoes, as well as trunks, suitcases, and other luggage, are also produced. A few of the other varied products are agricultural implements and industrial machinery, refrigerators, beet sugar, and refined petroleum.

#### Recreation Areas and the Tourist Trade

Michigan is the summer and winter playground for millions of visitors from all parts of the country. The tourist industry is an important source of income. In the upper peninsula it is second only to mining. In this rugged, mountainous area are wild lake shores and secluded waterfalls, forests abounding with game, and streams well stocked with fish. On Lake Superior, near Grand Marais, are the so-called "pictured rocks"—sandstone formations of gray, blue, green, and yellow, cut by wave action into fantastic shapes. Just off the Canadian shore near the northwestern coast of Lake Superior is beautiful Isle Royale. This island, 45 miles long, has been set aside as a national park.

Mackinac Island, in the Straits of Mackinac between Lake Michigan and Lake Huron, is a state park. Old Fort Mackinac, begun by the British in 1780, Fort Holmes, which they built during the War of 1812, and old stone blockhouses give the island historic interest. No motor vehicles are permitted to mar the quiet of its 25 miles of carriage drives, saddle paths, and foot trails. Les Chêneaux ("the snows"), a group of islands east of the straits, are famous for their muskellunge and other fishes. Some 300 islands near Michigan's shores lie within its boundaries.

The rivers are mostly short, and unimportant except for their scenery. The falls on the Tahquamenon River, near St. Ignace, are mentioned repeatedly in

Longfellow's 'Hiawatha'. The lower peninsula has more than five thousand lakes, many of them dotted with resorts. Quaint Saugatuck, on Lake Michigan in the south, is a famous artists' colony.

Many cities are noted for their annual celebrations,

#### HOW THE LAKES DIVIDE MICHIGAN'S PENINSULAS



The upper peninsula, extending east and west between Lake Superior to the north and Lakes Michigan and Huron to the south, contains most of the state's mines and forests. The lower peninsula, between Lake Michigan on the west, and Lakes Huron and Erie on the east, has thriving industries and rich farm lands.

such as the tulip festival of Holland and the fruit blossom festivals of Benton Harbor, St. Joseph, and Traverse City. Farther north perch and smelt festivals are held.

The cutting and burning of the virgin forests left large waste areas, unsuitable for agriculture. These lands are being reforested and recreation areas are being developed on them with accommodations for campers, hunters, and fishermen—a project which will be valuable both socially and economically. The state now has more than five million acres of national and state forests, state parks, game refuges, and public hunting grounds.

#### Forests and Forest Life

All Michigan was once a great forest. The southern half of the lower peninsula was a part of the extensive hardwood forest of the Ohio basin. A strip of white pine from 30 to 40 miles wide extended along most of



the shore of Lake Michigan, and the remainder of the state had a heavy growth of pines and other conifers. The sandy soil and moderate climate which formerly produced the pines proved ideal for developing the famous fruit belt. There are still 50 billion feet of uncut timber, chiefly pines and other conifers in the upper peninsula, in spite of heavy demands of numerous wood-products plants and paper mills.

About half a million hunting licenses are issued annually. Black bear, moose, deer, lynx, wolf, coyote, porcupine, and game birds still lure hunters. The game and bird sanctuary of Isle Royale attracts many nature lovers (see National Parks and Monuments).

In the remarkable dunes region along the southeastern shore of Lake Michigan, plants and trees that seldom grow so far north thrive in profusion.

The upper peninsula and the northern part of the lower peninsula are believed to have been a part of the great Laurentian highland, one of the oldest and most interesting areas on earth to the geologist. It is about the age of the Scottish Highlands and the mountains of Norway (see Laurentian Plateau).

Glaciation and weathering by winds and waters have covered most of the state with a great variety of soils and topography. These and a wide range of temperature, since the state extends through nearly six degrees of latitude, have produced a remarkable diversity in vegetation and agriculture.

#### A Rich Hunting Ground for Indians

Michigan before the coming of white men, 300 years ago, was a rich hunting ground for Indians, principally the Huron, Ottawa, Ojibway, Chippewa, and Potawatomi. Some of them paddled down the St. Lawrence with great bundles of furs to Quebec. There the *coureurs de bois*, or French fur traders, heard of the beautiful country in the midst of fair lakes and they visited it in search of pelts.

Then came a group of famous explorers and missionaries. Jean Nicolet was the first white man to penetrate this region. In 1634 he passed through the Straits of Mackinac and explored the southern shore of the upper peninsula of Michigan, continuing through Wisconsin to the south end of Green Bay and down the Fox River. The Jesuit priests Raymbault and Jogues in 1641 founded a mission for the Indians at Sault Sainte Marie, but this did not survive. In 1668 the French Jesuit missionary, Father Jacques Marquette, visited the early outposts, organized the first permanent white settlement within the present state at Sault Sainte Marie, and three years later established Michilimackinac, a mission station at St. Ignace, where the Straits of Mackinac connect the waters of Lake Huron and Lake Michigan. (See Marquette, Jacques; Sault Sainte Marie.) In 1673, the French-Canadian explorer, Louis Joliet, joined him on their famous trip of exploration across Lake Michigan to the waters of Green Bay and thence down Wisconsin's rivers to the Mississippi. La Salle sailed the first ship, the *Griffon*, up the Detroit River in 1679. A permanent settlement on the river was begun by

Antoine de la Mothe Cadillac, one of Louis XIV's soldiers of fortune. Impressed by the advantages of establishing a fort and trading post on the site of what is now Detroit, he obtained the consent of the king to carry out his plan. He returned in 1701 with soldiers and colonists and built Fort Pontchartrain, named after the French minister to the colonies. In 1751 its name became Detroit.

For 60 years the French flag flew over this country until it was lost at the close of the French and Indian War, and the important settlements at Detroit, Sault Sainte Marie, and Mackinac passed into the control of the English (see French and Indian War).

#### The Conspiracy of Pontiac

The coming of the English was resented by Pontiac, chief of the Ottawa Indians and leader of a confederacy that included the Potawatomi and Ojibway. In 1763 his confederacy and other associated tribes made a concerted attack on 12 fortified posts. At old Fort Mackinac they massacred all but one member of the garrison, who escaped through his friendship with one of the redmen. Pontiac himself laid siege to Detroit, but was forced to withdraw after five months.

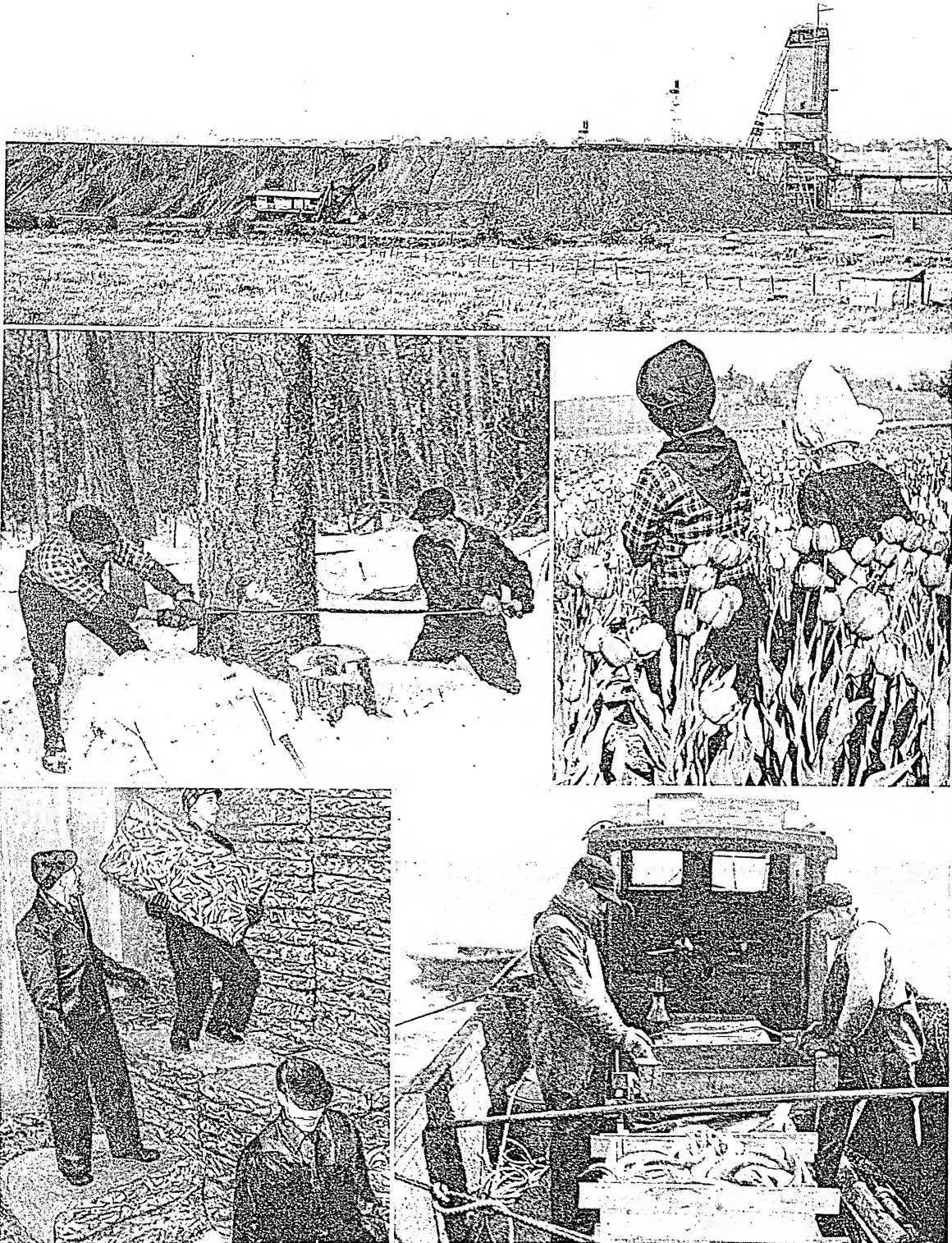
At the close of the American Revolution in 1783, Michigan formally passed into the hands of the Americans; but the British did not leave all outlying forts. Control of Detroit did not pass until July 11, 1796. British occupation ended in 1814 (see War of 1812).

In 1787, Michigan became a part of the newly organized Northwest Territory, and Gen. Arthur St. Clair, its first governor, faced the problem of halting the Indian attacks. When he failed in a campaign against them, President Washington sent out Gen. Anthony Wayne, who was experienced in warfare with Indians. He succeeded in making peace with the tribes so that Michigan and the neighboring country could be opened to colonization. In 1796, the settlers in the Detroit area formed the district into Wayne County, and thus honored his name.

#### From Territory to State

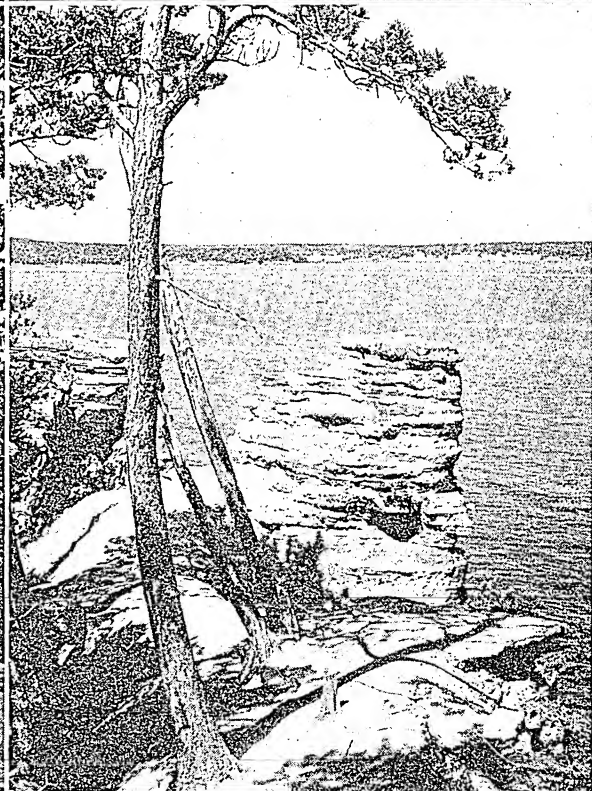
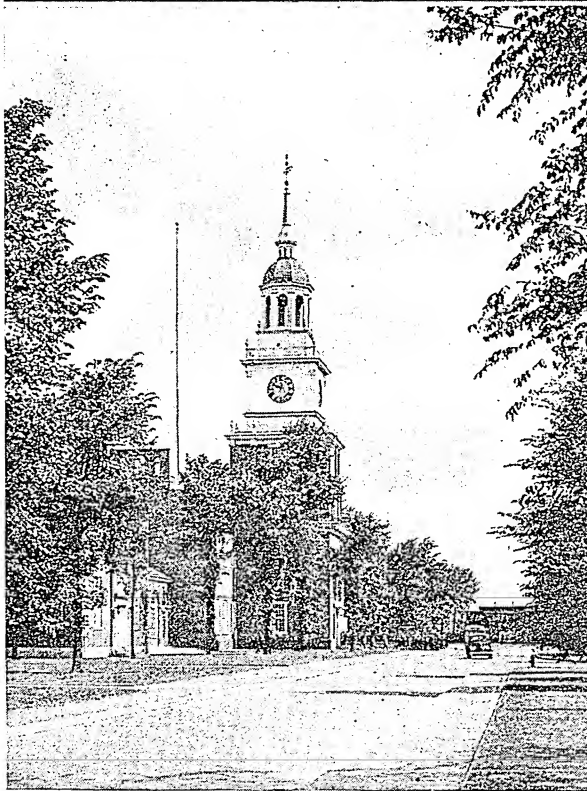
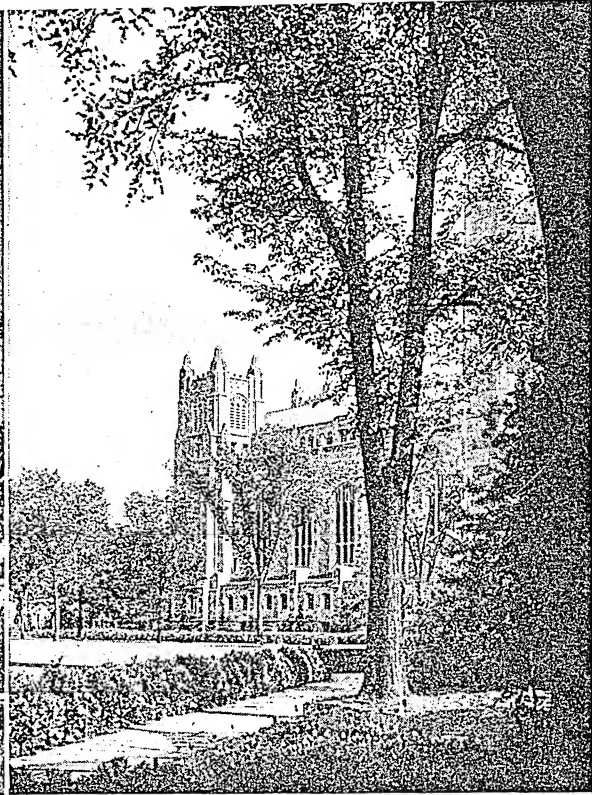
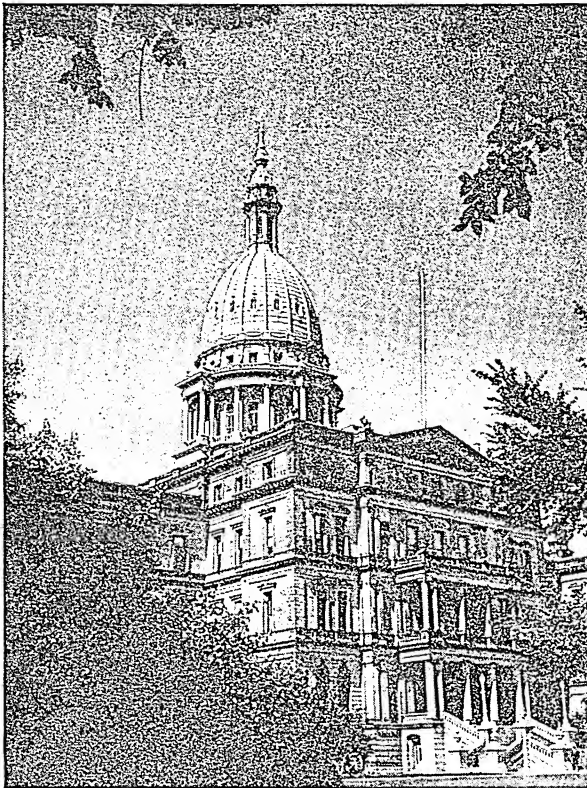
In 1805, Michigan was organized as a separate territory. It got its name from the Indian word meaning "great lake." Shortly before Gen. William Hull, its governor, arrived from the east, Detroit was practically wiped out by fire. It was then a settlement covering about 20 acres. Up to this time the interior of the country was practically unknown. Less than a dozen settlements had been made on its borders, and the total population in 1812 was not more than 5,000. In 1818, "Walk-in-the-Water," the first steamboat on the Great Lakes, began to make regular trips between Detroit and Buffalo. In the same year public lands were thrown open to settlers, and in 1819 Gov. Lewis Cass, who had succeeded Governor Hull, encouraged newcomers by a trip of exploration during which he established better relations with the Indian tribes. By 1820 Michigan had more than 20,000 within its boundaries. Settlement was rapid during the next ten years, especially after the Erie Canal opened in 1825, in spite of a cholera epidemic during 1832-34.

## VARIED RESOURCES OF LAND AND WATER



At the top you see a stock pile of ore on one of the Menominee Range mines that supply Michigan's most valuable mineral, iron. Below this, at the left, lumbermen are cutting timber. Much of the Upper Peninsula is still heavily forested, and millions of cubic feet of timber are cut every year. The children at the right are in one of the famous tulip fields that in spring attract thousands of visitors to the city of Holland. Fisheries, represented by the two bottom scenes, are another great natural resource. The frozen smelt are fed to mink on one of the state's many fur farms.

## SOME POINTS OF INTEREST IN MICHIGAN



The state capitol at Lansing (upper left) is shaded by fine old elm and chestnut trees. It was built in 1878. At the right is the beautiful Law Quadrangle of the University of Michigan. The Edison Institute of Technology (lower left), at Dearborn, is a private school and public museum founded by Henry Ford. The central building, a reproduction of Independence Hall, houses the Ford historical collections. Adjacent to the institute, on the east, is Greenfield Village, which re-creates the America of the 19th century. On the lower right are the fantastically shaped Pictured Rocks of Lake Superior, near Munising.



territory, the able George B. Porter. His successor, Stevens Thomson Mason, was but 21 years old, and some persons protested against "the boy governor." But Mason proved equal to the task, and soon proposed that the territory should petition to enter the Union as a state. Already 80,000 settlers had been attracted to its boundaries, 20,000 more than the Ordinance of 1787 held was necessary for the organizing of a state in the Northwest Territories. Admission to the Union was delayed until 1837 because of a dispute with Ohio over the southern boundary line, which resulted in the "Toledo War" (see Ohio). At first the capital was at Detroit; in 1847 it was moved to Lansing.

In Michigan's three state constitutions adopted in 1835, 1850, 1909, local home rule has been increasingly favored. Amendments may be initiated by the signatures of ten per cent of the voters. The initiative, referendum, and recall have been adopted.

Michigan was one of the first states to establish a free public school system. It was the first state to have a state superintendent of schools. John D. Pierce, who held the office, 1837-42, has long been known as "the father of public school education in Michigan." State teachers colleges are located at Ypsilanti, Mount Pleasant, Marquette, and Kalamazoo. The University of Michigan at Ann Arbor, established in 1841, has long been a leader in higher education. Michigan State College of Agriculture and Applied Science, at East Lansing, opened in 1857. It was the first college of agriculture in the United States.

**MICHIGAN, LAKE.** The only one of the Great Lakes lying entirely within the United States, Lake Michigan, is third of the group in size. It is 307 miles long, 118 miles at its greatest width, has a coast line of 1,304 miles, and an area of 22,400 square miles. It is like Lake Huron, with which it connects through the Straits of Mackinac, in the fact that its surface lies 580 feet above sea level. The greatest depth is 923 feet. The natural flow of its waters is northward, but so low is the water passing near Chicago that a comparatively shallow 30-mile channel gives it an outlet to the Illinois River and thence to the Mississippi. This channel—the Chicago Drainage Canal—makes a link in a continuous water highway for small vessels from the Gulf of St. Lawrence to the Gulf of Mexico.

On Lake Michigan you will often meet huge car ferries, operated by railways, to ferry freight trains between Ludington in Michigan and Milwaukee, Manitowoc, and Kewaunee in Wisconsin. They are built large enough to carry 30 cars or more, and so strong that they can cross in any weather, even crashing through the ice sheet that sometimes stretches from shore to shore. Lake Michigan has two of the seven greatest lakeports of the United States—Chicago and Milwaukee. (See Great Lakes.)

**MICROMETER.** A difference of  $\frac{1}{1000}$  of an inch may not seem important, but some parts of an automobile or a sewing machine have to fit even closer than this.

For such work machinists employ devices called micrometers (from the Greek words meaning "small measure"). The commonest type is operated by a screw having 40 threads to the inch. Each turn of the screw, then, moves the measuring spindle  $\frac{1}{40}$  or  $\frac{25}{1000}$  of an inch. A scale revolving with the screw is divided into 25 parts, and indicates, therefore, the fractions of a turn in units of  $\frac{1}{1000}$  of an inch. Sometimes such a micrometer carries in addition a "vernier" scale with which a movement of  $\frac{1}{10000}$  of an inch can be read. Micrometer readings are usually written as decimals or as *mils*; for example, the thickness of an ordinary sheet of newspaper is about .0035 in. or 35 mils.

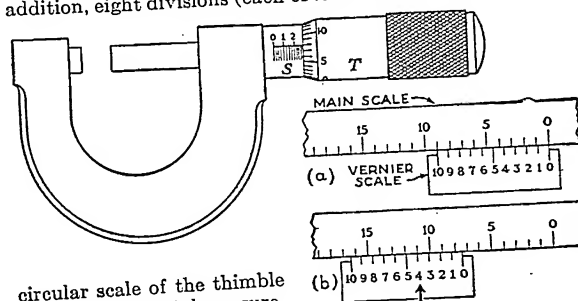
Micrometer devices of even greater delicacy are frequently attached to microscopes and telescopes. Some consist of simple scales ruled on glass with a fine-pointed diamond. These rulings are themselves made by "dividing engines" regulated on the micrometer principle and capable of marking as many as 120,000 lines to the inch. A common unit for such scales in scientific work is the *micron* ( $\frac{1}{1000}$  of a millimeter or about  $\frac{1}{25000}$  of an inch). The object to be measured is compared with this scale, both being equally enlarged. Another device moves the image of the object across a hair-line in the eye-piece of the instrument, consisting of a spider's thread or a quartz fiber. The distance moved is indicated by the turn of a micrometer screw.

With the aid of micrometer controls, gauge blocks can be made that are accurate within  $\frac{1}{100000}$  of an inch at standard temperatures. Such blocks have been used in adjusting instruments for measuring the velocity of light. Similar blocks, though not necessarily so exact, are employed to check the accuracy of tools and dies in automobile and airplane factories.

### Reading a Micrometer and Vernier

Reading a Micrometer and Vernier

In the first picture below the scale on the sleeve S shows two large divisions (each equal to .100 in.), plus three small divisions (each equal to .025 in.), making .275 in. In addition, eight divisions (each of .001 in.) are recorded on the

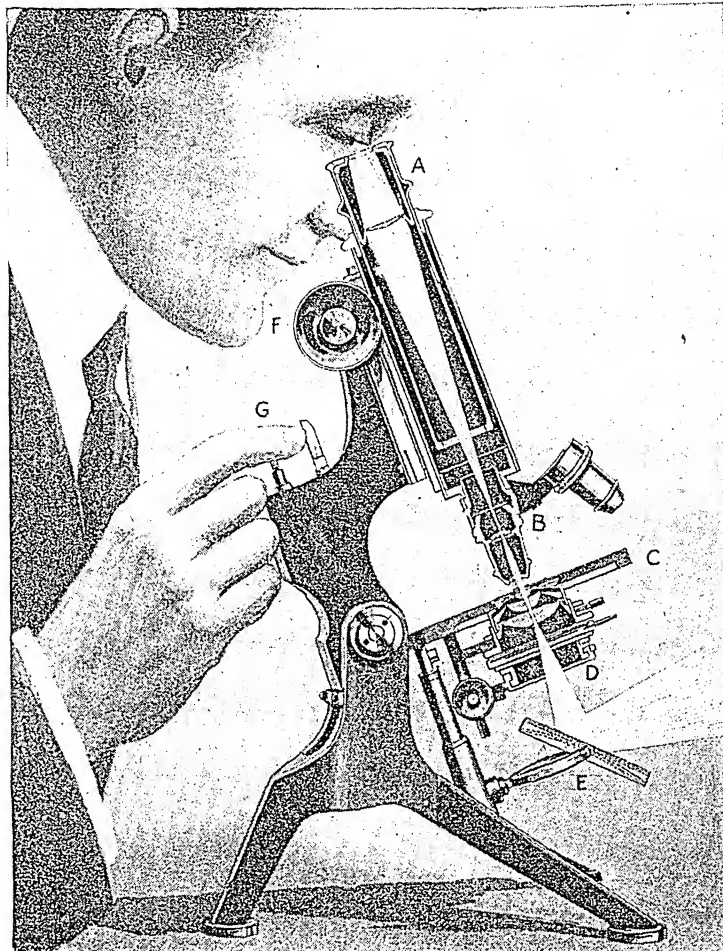


circular scale of the thimble T, making the total measurement .275 plus .008 or .283 in.

The other drawings show how a vernier makes it possible to further subdivide the smallest division on any scale into tenths. The vernier (a) above has ten divisions in the space occupied by nine divisions on the main scale, each vernier unit being therefore one-tenth shorter. How this system applies to a measurement is shown (b). Seven and a fraction units are indicated on the main scale. To determine the amount of that fraction, find the vernier division which most closely coincides with a main scale division. Obviously it is No. 4. The fraction then is  $\frac{4}{10}$ , and the whole measurement is 7.4.

## EXPLORING *the Mysteries of the* INFINITELY SMALL

*The Mechanical "Eye" that Shows Us Worlds of Wonder in a Drop of Water*



The object to be viewed is carried on a glass slide which rests over a small hole on the stage (C). Light from the mirror (E) is cast up through the condenser (C) and passes up through the hole on the stage, brightly illuminating the object to be examined. The light from the object then enters the objective lens (B) where a reversed magnified image is produced. The eyepiece (A) enlarges this image further for the eye. (F) and (G) are focusing screws.

**MICROSCOPE.** A magician revealing fantastic worlds of wonder in a drop of water or a speck of animal tissue—such, indeed, is the microscope; but it is very much more than this also.

The telescope adds much to human knowledge, but in many ways the knowledge gained by the microscope affects our lives more directly. Up-to-date physicians use the microscope to track diseases to their sources in various forms of bacteria, and the conquest of many diseases is due primarily to the use of the microscope. Surgeons determine whether severe operations for new growths in the body are necessary by microscopic examination of a section of tissue. Botanists; biologists, and bacteriologists rely on it in their studies which enlarge the bounds of knowledge and increase man's mastery of nature. It is used to determine the physical structure of steel,

iron, and other metals, and to detect adulteration in foods, drugs, starches, and paints; and the Federal Bureau of Animal Industry depends on it to detect parasites in meats.

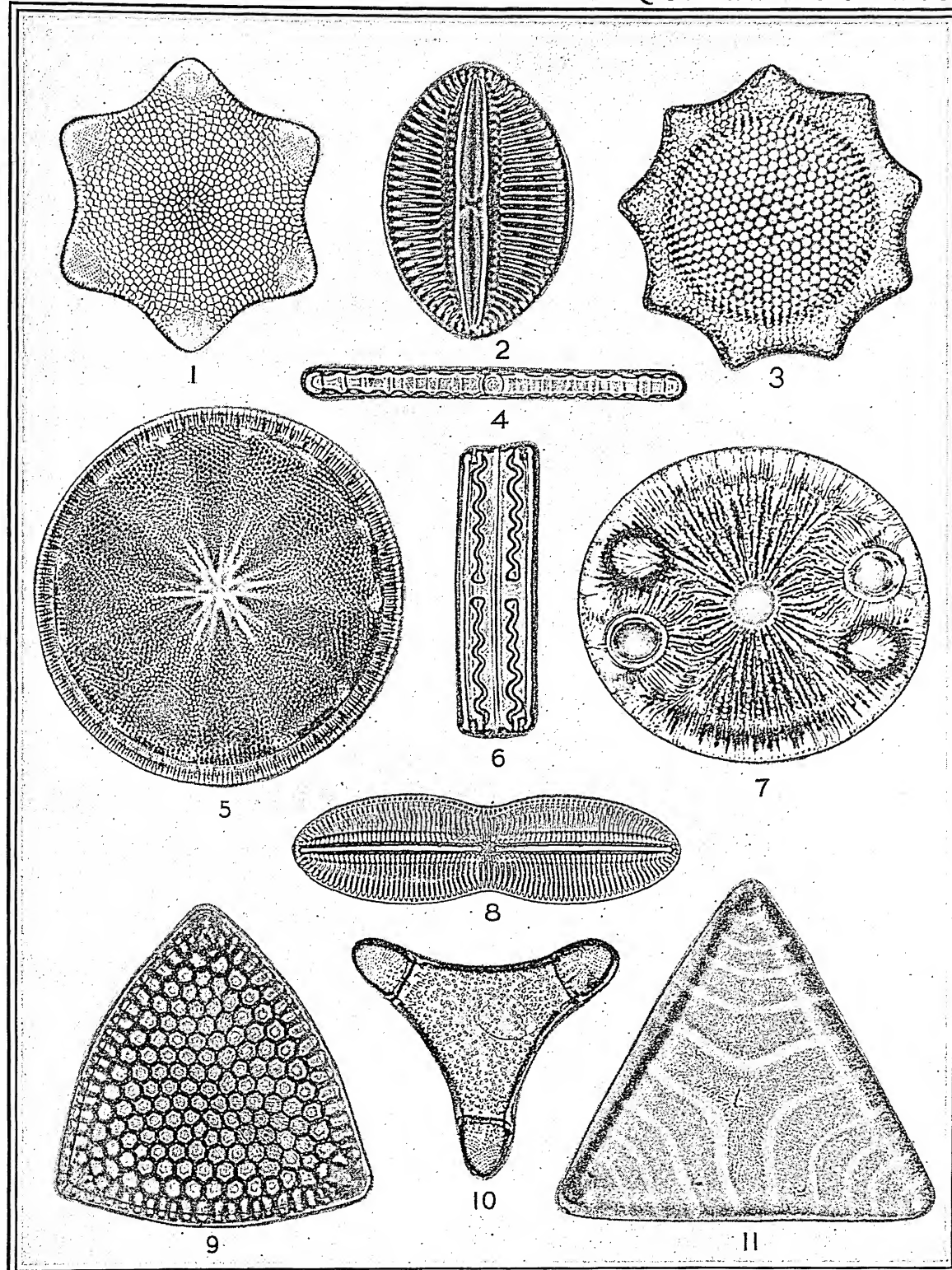
Ordinary magnifying glasses or simple microscopes—convex lenses used to obtain a magnified view of an object—were apparently known, at least as curiosities, from remote times; but the compound microscope was invented some time between 1590 and 1610. Galileo, the famous astronomer, is one to whom is ascribed the honor of inventing the microscope. Remarkable discoveries in anatomy and biology were made by the use of both forms in the 17th and 18th centuries. For example, the Dutch scientist Leeuwenhoek, sometimes known as the "father of microscopy," showed that weevils, fleas, and other minute creatures are not "spontaneously generated" but come from eggs; and the Italian, Malpighi, was the first to see the capillary circulation of the blood, previously inferred by Harvey. Yet, on the whole, the microscope remained a marvelous toy until comparatively recent times.

A simple microscope may be a single lens, or a set of lenses; if all are used together to view the object directly, it is a simple microscope. A compound microscope uses a lens called the object glass or objective to produce a reversed magnified image, and another, called the eyepiece or ocular, to magnify this image.

Both objective and ocular, in actual practice, are composed of several lenses, because lenses are subject to the two defects of spherical and chromatic aberration (see Lens). Spherical aberration can be cured by grinding the lens in a parabolic curve, that is, making the lens a little thicker in the center than if it were a slice of the outside of a sphere. The practical difficulties of grinding true parabolic curves are so great, however, that spherical aberration is ingeniously corrected by compounding the lens. Chromatic aberration is corrected by using a convex crown-glass lens and a concave flint-glass lens, and the curves of the two are contrived to supplement each other so as to cure spherical aberration at the same time. Often more than two lenses are used in the objective or the eyepiece.

The high-power compound microscope is a delicate, elaborate, and expensive instrument, requiring skill, training, and patience in its use. The tube carrying

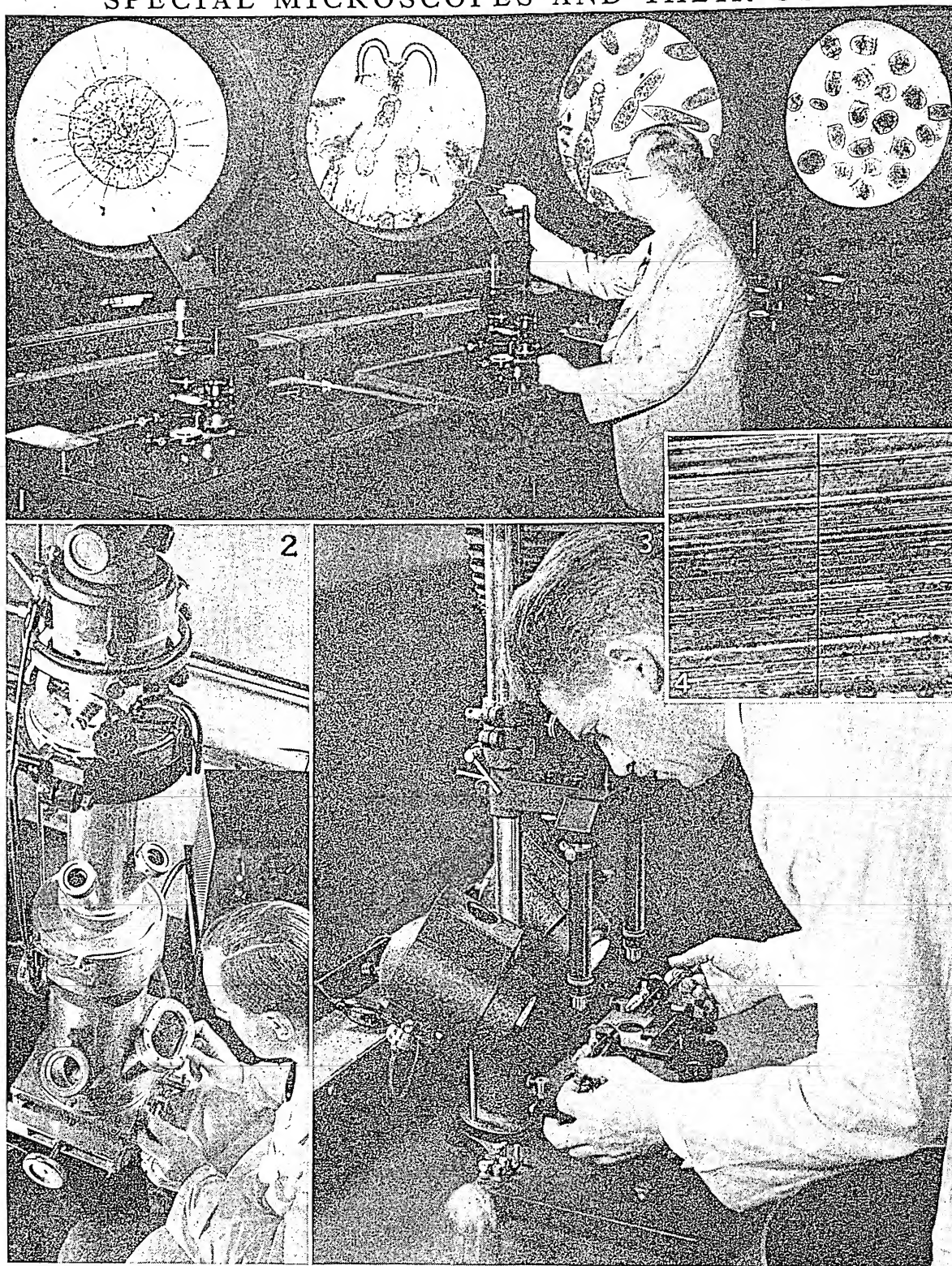
## DIATOMS—TINY PLANTS OF EXQUISITE DESIGN



Housed in glass-like cases, whose beauty of form and pattern is almost unrivaled in nature, diatoms inhabit the waters in incredible numbers. These one-celled plants average less than  $\frac{1}{250}$  of an inch in size, yet they provide the basic food of all animal life in the sea, and their fossil shells are put to many commercial uses. The photomicrographs above show us 11 of the 8,000 described species: 1. A six-angled form with delicate lacework. 2. Boat-shaped and striated. 3. Nine-angled, with honeycomb pattern. 4. Linear, resembling a lady's bar-pin. 5. Circular, "The Shield of the Sun." 6. Rectangular, ornamented with a scroll. 7. Oval, with radiating lines. 8. A "double" diatom. 9 to 11. Triangular forms, one concave, one convex, one straight-sided.



## SPECIAL MICROSCOPES AND THEIR USES



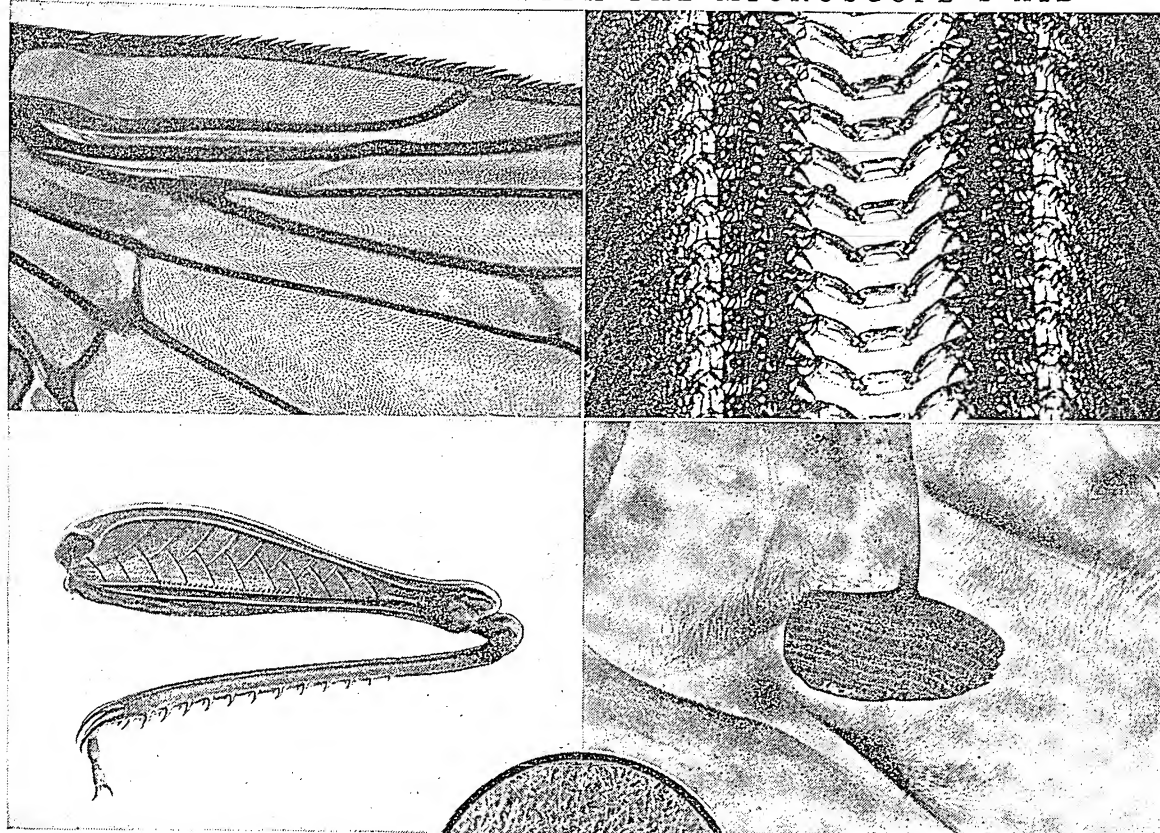
1. Behind the scenes in a microvivarium, devised by Dr. George Roemmert. Under each microscope is a sample of pond life brilliantly lighted from below. The enormously enlarged image is directed against the transparent screen by a mirror set at an angle. Visitors view the screens from the other side. 2. New insight into the "infinitely small" is provided by this Siemens electron microscope. By passing a stream of electrons over an object and allowing the changed pattern of the stream to fall upon

a photographic plate, structures ten times below the range of optical microscopes are revealed. 3. The comparison microscope, with two objective lenses attached to a single eyepiece, brings together side by side for detailed comparison the images of any two similar objects. It is widely used by criminologists. 4. Here, for example, we see the sides of two bullets. The marks made on each of them by the gun barrel through which it passed match so closely as to prove both were fired from the same weapon.

5,000 Times Larger!

MICROSCOPE

# PHOTOGRAPHS MADE WITH THE MICROSCOPE'S AID



the eyepiece is adjustable for different angles of observation and different distances from the objective. It is provided with a micrometer to measure the object, which is carried on an adjustable stage or, if very high powers are required, placed in oil or water between the objective and a cover glass, and illuminated by light thrown from a mirror through a condenser. A "camera lucida" attachment may be used to throw the magnified image on a sheet of paper on which it may be traced.

## The Limits of the Microscope

The power of such a microscope depends on the power of the object glass, the power of the eyepiece, and the separation of eyepiece and objective—the greater the separation, the higher the power. Powers of enlargement of more than 2,000 diameters are attainable for visual use, and photographs of minute objects enlarged 5,000 diameters have been produced.

Is there any limit to this marvelous instrument? Can we not obtain ever higher and higher powers, so that at last we can peer into those ultimate mysteries—molecules, atoms, and electrons?

In the upper left-hand corner is a House-Fly's wing, so much enlarged that you can plainly see the ribs and the curious texture of the wing surface. The right-hand picture shows a portion of the palate of the Abalone, a kind of shell fish. With the help of the microscope its linked structure is plainly evident. The lower left-hand corner shows the Grasshopper's hind leg, while the right-hand picture shows the "stridulating disk" with which the insect known as Water Boatman produces its curious noise. The circle shows a piece of paper, with the fine cellulose fibers appearing almost as coarse as hay.

There are certain practical difficulties, the chief of which is not the imperfection of the instrument but the very nature of light and vision. We see non-luminous objects by the light which they reflect, and light is composed of waves. An object much smaller than the wave length of light cannot reflect light, any more than a pebble can break an ocean wave. Now, atoms and even the largest molecules are far below the size of light waves, and as for electrons, they are almost unimaginably smaller. The wave length of light also puts a limit to the magnification of telescopic images by the eyepiece (see Telescope).

Yet a way has been found to show, under certain definite conditions, not, indeed, the shape and size of ultramicroscopic particles, but their existence, number, and movements. An object too small to reflect light diffracts it—scatters it all around—and may be seen against a dark background as a bright point, or rather an almost infinitesimal disk, tiny indeed yet far larger than its real size. An "ultramicroscope," so called, is a microscope with attachments to show ultramicroscopic



particles viewed across a shallow beam of intense light against the darkest possible background, as dust particles are seen dancing in a sunbeam traversing a dark room. These movements are called the "Brownian movements." A powerful microscope of the ordinary type will show objects a few "microns" in diameter (a micron is about  $\frac{1}{25,000}$  of an inch), the lowest limit being about one-tenth of a micron. With the ultramicroscope particles measured in thousandths of microns may be detected.

Photomicrographs made with ultra-violet rays reveal details over which visible rays would pass without reflection or refraction. Still smaller details are recorded by the electron microscope which focuses a stream of electrons upon the object. Every tiny variation in structure causes a variation in the electron stream, which then impresses its pattern on a photographic film.

## A THOUSAND YEARS of EUROPE'S HISTORY

**MIDDLE AGES.** History is continuous like a stream, and just as a stream has rapids and waterfalls, so too has the great stream of human life. One great waterfall, so to speak, in the stream of European history was in the 4th and 5th centuries, when the Roman Empire crumbled and fell; after that until the 15th century, the stream flowed on with no strikingly abrupt changes. The years between those centuries are known as the Middle Ages, although, in fact, they were no more "middle ages" than any other historical period. The term "middle ages" was applied to them some 300 years ago, and has clung to them ever since. The name is somewhat misleading, for it suggests that these years were peculiarly uneventful; whereas the truth is, as careful students of history have found, they were years of great significance for the development of many important features of our present day social and political arrangements. No one can understand some of our existing institutions without understanding something of the life and institutions of the Middle Ages.

### Romans, Christians, and Barbarians

If we go back in imagination along the stream of history till we come to the 4th century, we shall find the Roman imperial government holding sway over the entire Mediterranean basin, and over some regions beyond it. The Romans had conquered the Greeks, the Gauls, the Carthaginians, the Egyptians, and various other peoples. Roman civilization was made up of many mingled elements held together by the army, the roads, the trade, the law, and the government of the empire. (See Roman History.)

A number of religions flourished in the empire, for the government, when it conquered a city or a region, allowed the people to keep their own religion and merely required them to give homage to the emperor. In a remote province, there grew out of the religion of the Jews the Christian faith. The Christians believed that homage to the emperor was idolatry, and

**MIDAS.** According to mythology, Midas, an ancient king of Phrygia, in reward for a kind act was promised by the god Dionysus whatever he should ask. Midas asked that everything he touched might turn to gold. When the request was granted, he found to his sorrow that there are many things more necessary, for even his food became gold, and he begged the god to take back the gift.

According to another story, Midas once decided a musical contest between Pan and Apollo, giving the prize to Pan. Apollo in revenge gave him a pair of ass's ears to show the god's opinion of his musical judgment. Midas hid his ass's ears under a cap, but his barber discovered the secret and was so excited by it that he dug a hole in the ground and whispered into it: "King Midas has ass's ears." A reed is said to have grown from this hole, and its whisperings spread the secret everywhere.

that other religions were false and should be destroyed. In the resulting struggle, the Christians were prosecuted as enemies of the government; but their courage and zeal and thorough organization prevailed. In the early 4th century, the great emperor Constantine (288?-337) sought their aid against his enemies, and in return made Christianity the official religion. By the end of the 4th century, the emperor Theodosius (346?-395) had outlawed all other religions. (See Church, Christian.)

At this time, on the borders of the empire, hordes of barbarians threatened both the church and the government. On the north were many tribes of Teutons, so barbarous, as Tacitus wrote about 100 A.D., that they had no word for autumn. This shows that they were still merely hunters and fishermen and had not advanced to the agricultural stage of civilization. However, they were bold and warlike and were learning of the wealth in sunny Mediterranean countries and of the weakness of the Roman armies. To the northeast of the Black Sea and the Caspian, on the world's greatest plain, tribes of fierce nomads wandered with their flocks and herds. Among these were the Huns, who were of the Mongolian type, small in stature, with yellowish dull skin, dark straight hair, and slanting eyes. Moving westward between the Ural Mountains and the Caspian Sea, they met the Goths, who were Germans. Some of the Goths, fleeing before the Huns, crossed the Danube River in 375 and settled in the empire. Soon they quarreled with the Romans, and in the battle of Adrianople, in 378, decisively defeated the emperor's legions. These events were followed by a "wandering of the peoples." Not only Huns and Goths, but also Vandals, Burgundians, Lombards, Franks, Angles, Saxons, and various other tribes wandered at will over the empire, pillaging, fighting, sacking Rome, and hastening the breakdown of the empire. "The whole world," wrote St. Jerome, "is sinking into ruin."



The Roman world indeed was sinking into ruin; yet, in the midst of these troublous times, several forces kept society from falling into complete disorder. One of these was the Byzantine Empire, the eastern or Greek portion of the Roman Empire. It survived the barbarian invasions; and the armies of the mighty emperor Justinian (483?-565) even for a time reclaimed Italy and northern Africa from the invaders. In Constantinople, art and industry flourished. Justinian's architects built one of the world's finest structures—the cathedral of St. Sophia. His lawyers collected, edited, and reduced to a code the great system of Roman law. Throughout the Middle Ages, the Italians carried on extensive trade with the Byzantines and brought back to the West much of the culture of antiquity and of the East. (See Byzantine Empire; Justinian I.)

#### Rise of the Franks

Among the barbarous tribes that invaded the empire in the West, the Franks differed in simply expanding from their Rhineland home as a base, and thus retained strength and stability. Most of the other tribes, instead of expanding, migrated. The Vandals, for instance, moved all the way from north central Europe to Africa, where they built up a short-lived kingdom. The great kings of the Franks included Clovis in the late 5th century, Charles Martel, conqueror of the Mohammedans at Tours, in 732, and Charlemagne, who in 800 was crowned emperor of the Holy Roman Empire by Pope Leo III. These powerful rulers, although often brutal, helped to rescue the age from lawlessness and disorder. Important invasions, in addition to those of the Franks, were made by the Angles and the Saxons, Germanic tribes that began to settle in England beginning with the 5th century. They established

several kingdoms, out of which grew the system of shires, or counties. To this day, in America, the counties have "shire reeves," or sheriffs. Basic elements of English, German, and French civilizations are traceable, respectively, to the Anglo-Saxons, the East Franks, and the West Franks.

When Clovis was converted to Christianity, in 496, many of the Germans were heretics, and some were still pagans. Clovis and his successors allied themselves with the bishop of Rome, or the Pope; and the peoples they conquered obeyed the Roman bishop as head of the church.

In these years of invasion and uncertainty, the monasteries did much to preserve knowledge of the arts, crafts, industries, and literature of Roman times. They were also important in providing a discipline and a bond of union which helped to hold society together in an age when it was threatened with destruction or with reversion to savagery. (See Monks and Monasticism.)

The great emperor Charlemagne became an ally of the Pope, and they subjected the barbarous invaders to a civilizing discipline. However, even during the reign of Charlemagne, his dominions, which included nearly all of central and western Europe, were endangered by new invasions. From the southeast came the Arabs; from the Great Plain of Asia, the Avars, the Bulgars, and the Hungarians; from northeastern Europe, the Slavs; and

from the Scandinavian Peninsula, the Northmen. Charlemagne's empire soon fell apart, and in its place there grew up a large number of feudal states. The feudal lords acquired power as organizers of defense against the invaders. (See Feudalism.)

In the eastern portion of the empire of Charlemagne there were several very powerful feudal lords. Henry

THE BAPTISM OF CLOVIS



The conversion of Clovis, King of the Franks, to orthodox Christianity was one of the most important historical events of the early Middle Ages. The alliance between him and the church was highly advantageous to both. This picture, showing Clovis being baptized on Christmas Day of the year 496, is from a mural painting by Joseph Blanc in the Panthéon at Paris.

the Fowler and his son, Otto I, drove out the Hungarians, repelled the Northmen, built towns, called "burgs," which at first were little more than fortresses, and subdued their unruly nobles and bishops. Many people still longed for a great empire, such as that of the ancient Romans. These ideas found expression in 962 in the crowning of Otto I at Rome as emperor of the Holy Roman Empire. (See Holy Roman Empire.) The emperor was viewed as the ally of the pope and the protector of the church. But emperors and popes soon came to swords' points in a struggle called the "Investiture Conflict." (See Gregory VII; Henry, Holy Roman Emperors.)

#### Medieval Background of Modern Governments

While the popes and the emperors in Italy and Germany were wasting their energies in fighting each other and preventing both the Germans and the Italians from uniting under strong central governments, in France and England the kings were gradually extending their powers on a firm basis. In each country the king had a feudal council consisting of his vassals. At first, all government was carried on by the king and his council. When public business became more complicated, various institutions grew out of the council. Many of these still exist.

Why, for example, does Congress consist of two houses, the Senate and the House of Representatives? This arrangement was copied from the English, and the English acquired the bicameral, or two-house, system in the Middle Ages. The nobles were members of the king's council because they were his vassals. In the 13th century, when the kings decided to call on the wealthy townsmen and the lesser landlords for money, they began the custom of sending out orders (writs) to the sheriffs of the counties, calling on the wealthy middle classes (commoners) to elect representatives to sit with the nobles in the

council. They preferred, however, to sit separately, and so the House of Commons was formed.

Many other modern institutions and practises are fully as old. Among these are counties and sheriffs and county courts, townships or parishes, and constables, writs, juries, circuit judges—all of them familiar features of our government. Our system of law and of procedure in the courts goes back as far as the 12th century. Many people believe that some of our difficulties in dealing with crime and with social injustice are due in part to old forms of procedure.

This brief story of the Middle Ages has been confined to the framework of society, and especially the great institutions of government and religion. This framework was built up as a defense against the invasions and other dangers of the period, and was adapted to a simple, self-sustaining farm life.

In the 12th and 13th centuries, when a greater measure of peace and order had been established, the age of rapid change in the political, social, and intellectual life of Europe began. It was the age of the great struggle for power between the papacy and the empire and it was the age of the Crusades, when hordes of Christians, fired by zeal to rescue the Holy Land from the Mohammedans, were traveling to and from the East, bringing new ideas, new customs, and new products to Europe. These centuries saw the rise of commerce and of the towns, which spelled the doom of feudalism, and the beginnings of monarchical states. They saw the rise and development of universities and scholastic philosophy, and an intellectual and artistic awakening that was to flower in the centuries that followed. Later, the horizon of Europeans expanded to include even the Far East—India and China and the Spice Islands. Out of all these new influences came the Renaissance and the dawn of modern history. (See America; Renaissance.)

### — REFERENCE-OUTLINE for Organized Study of THE MIDDLE AGES —

FOR a thousand years after the barbaric Germanic hordes had swept down upon the weakened Roman Empire, Europe went through a constant evolution, as conquerors and vanquished became fused and settled down and new nations were formed. The three chief elements in the medieval civilization that developed were the classical culture of the Roman world—for, while the Germans destroyed much, they absorbed such elements as they could understand and use; the freshness and vigor of the barbarians and their ability to adapt themselves to new conditions; and the Christian church, whose unbroken rule over the lives and spirits of men down to the time of the Reformation is one of the most striking features of the Middle Ages.

The life of the age presents a picture of startling contrasts. The sordidness of daily existence was varied by splendid exhibitions of lofty enthusiasm and by hideous deeds of brutality. "It was an age of chivalry and ideal heroism, of picturesque castles and glorious churches and pageants, camps and tournaments, lovely charity and gallant self-sacrifice"; and it was on the other hand a period darkened by "dynastic faction, bloody conquest,

grievous misgovernance, local tyrannies, plagues and famines unhelped and unaverted, hollowness of pomp, disease, and desolation."

#### I. THE ROMAN EMPIRE:

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'MIDSUMMER NIGHT'S DREAM'. According to the plot of this fanciful comedy, written by Shakespeare, Oberon, King of the Fairies, and Puck or Robin Goodfellow, his elfin lieutenant, set out to bewitch Titania, Oberon's fairy queen. Discovering two pairs of lovers wandering in the Athenian wood, they include them also in their enchantments, as well as a company of workmen who have come into the wood to rehearse a rustic play with which to win the favor of the Duke of Athens on his wedding day.

Queen Titania awakes from sleep to be most absurdly in love, under the enchantment, with "bully Bottom, the weaver," the chief of the clownish actors, on whom the mischievous Puck has placed an ass's head. In a highly comic scene her attendant fairies scratch Bottom's donkey-head, while their fond mistress kisses the "fair large ears" of her "sweet love." The wandering lovers wake to find their loves reversed, and charming Hermia is about to scratch out fair Helena's eyes. Puck, being a mischievous sprite, watches this sport in glee, but Oberon soon takes pity on them all, releases Titania from her foolish fancy, gives Bottom back his own foolish head, and the lovers their proper loves. Then at daybreak, all the human folk hasten back to Athens, the lovers to be wed, and Bottom and his friends to present their play—the oft-told story of Pyramus and Thisbe,

two lovers who, kept apart by their parents, yet conversed through an opening in the wall that separated their houses. One night they planned a secret meeting. Thisbe, startled by the roar of a lion, ran away,

dropping her veil. When Pyramus arrived and found the veil torn by the lion's blood-stained jaws, he imagined Thisbe had been slain and stabbed himself. Thisbe, returning, found the body of her lover and ended her life with the same weapon. As presented by the rustics, the tragedy becomes a laughable burlesque. With this "tragical mirth" the play ends.

**MIGNONETTE** (*mignon-ët*). The French have given this delicately fragrant flower the name of mignonette, which means "little darling." In Africa and Asia Minor the mignonette is a plen-

tiful weed, but in Europe and America it is one of our garden favorites. From the low mass of smooth green leaves rise spikes of inconspicuous blossoms of shaggy white and green, touched with bronze and brightened only by the little red anthers within. Find a spot where the soil is rather light when you sow the seeds, and you will have a continuous supply of these fragrant flowers.

Scientific name, *Reseda odorata*. Flowers have 4 to 7 spreading sepals and the same number of petals attached beneath the ovary. Stamens, 10 to 40; anthers are large, dull, and a reddish-orange; leaves alternate and spatulate, sometimes notched or 3-lobed; stem upright.



Here we see Puck, the mischievous sprite of 'Midsummer Night's Dream', sitting on a toadstool surrounded by his elfin crew.

## Across LAND and SEA with ANIMAL TRAVELERS

**M**IGRATION OF ANIMALS. The migration of birds and animals is one of the greatest wonders of nature. Salmon migrate from the sea to the headwaters of certain rivers to lay their eggs; the fur-seals congregate from all parts of the Pacific upon certain of the Pribilof Islands to raise their young; and the monarch butterflies move southward with the onset of cold weather. These are examples of the remarkable power with which nature has endowed many of her children.

But where in all the book of nature will you find anything to compare with the journey of the little bobolink, that makes the fields of northern United States ring with melody during the summer? Long before cold weather sets in, he starts on a journey which takes him 5,000 miles over land and sea, over forest-covered mountains and grass-covered plains, to the pampas of southern Brazil; only to return once more the following spring, to exactly the same clover field and the identical patch of daisies from which he started! Even more wonderful is the journey of the Arctic terns, some of which nest within the Arctic Circle, and all of which winter on the islands of the Antarctic Ocean. Their summer and winter homes are separated by 10,000 miles of ocean, over which they migrate with the unerring flight of a homing pigeon that has been taken but a few miles from its loft.

It must not be thought from this that all birds migrate, or that all who do migrate travel long distances. Even in the northern United States and Canada, many of the woodpeckers, nuthatches, chickadees, grouse, and other birds are permanent

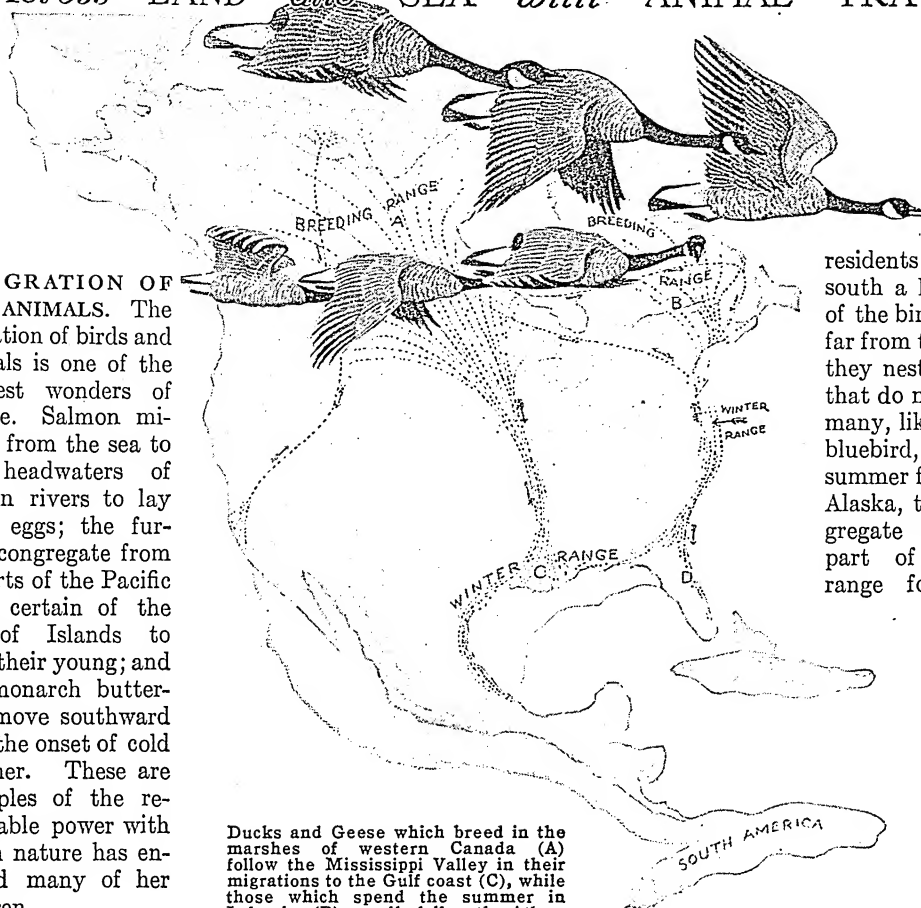
Ducks and Geese which breed in the marshes of western Canada (A) follow the Mississippi Valley in their migrations to the Gulf coast (C), while those which spend the summer in Labrador (B) usually follow the Atlantic coast to their winter resorts in Florida (D). The sea-ducks, known as Scoters, follow in their annual migrations that peculiar line marked by the arrows at the right, swinging over south of the Great Lakes to their breeding grounds, then back through Labrador and due south again. The arrow-line at the extreme left shows how Ross' Goose migrates between the Arctic Circle and California.

residents; while farther south a large percentage of the birds do not travel far from the region where they nest. Of the birds that do migrate, there are many, like the robin and bluebird, found during the summer from the Gulf to Alaska, that merely congregate in the southern part of their breeding range for the winter.

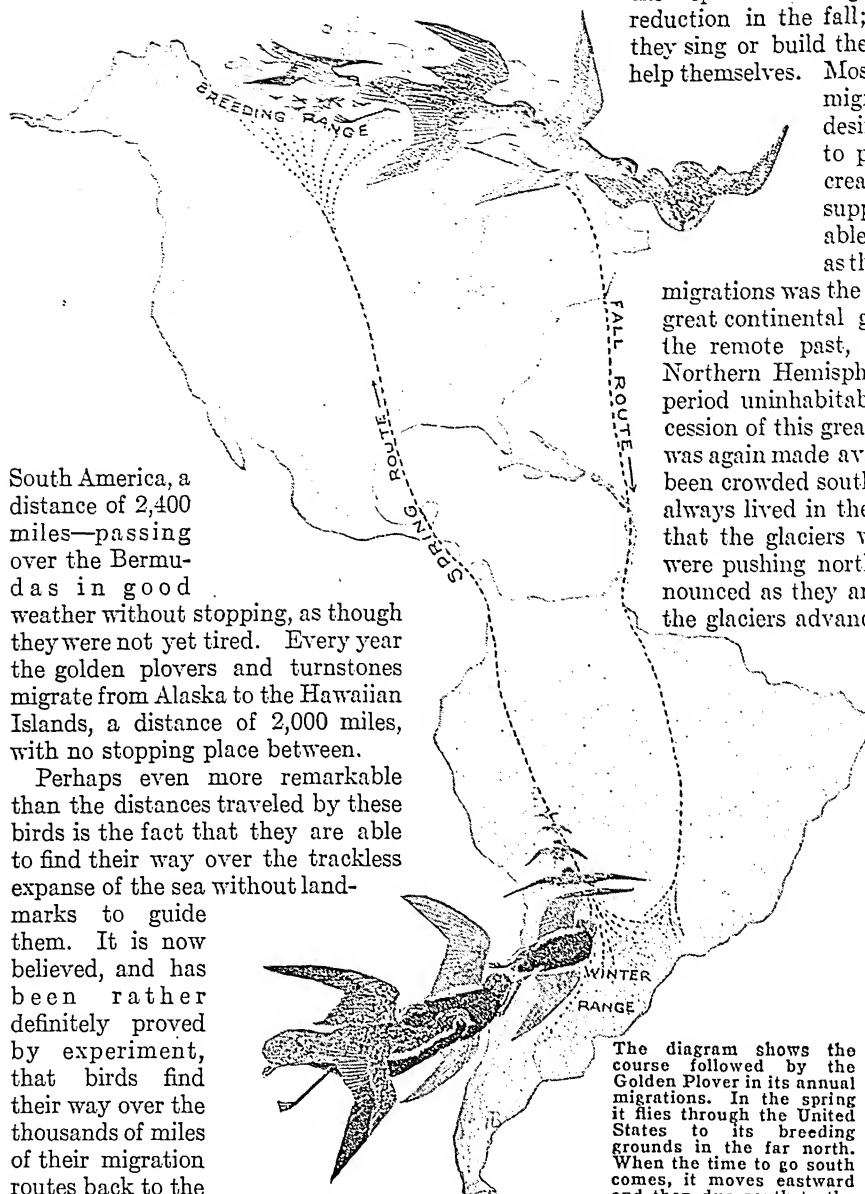
Others, such as the orioles, vireos, and humming-birds, leave the United States, but go only as far as Mexico or Central America. All but one of our flycatchers, however, over half of our warblers, and several of our

sparrows, thrushes, rails, herons, ducks, and shore-birds are not content until they are well within South America for the winter. Indeed, certain of the sandpipers and plovers wander even to Patagonia, though they nest within the Arctic Circle.

Most of these long migrations are performed by night, for there are comparatively few birds that can feed while they fly, especially in open country; and they must therefore reserve the daytime for feeding. On cloudy nights, when the birds are passing low to escape flying in the clouds, one often hears them as they call to each other; but even if you are familiar with their daytime calls you can recognize but few of the notes which you hear at night. The distance traveled in any one night or in any one continuous flight is ordinarily not great, perhaps not more than 200 or 300 miles; but certain birds are known to travel enormous distances, apparently without stopping. The golden plovers, for example, leave Labrador and Nova Scotia for a direct flight over the Atlantic to



## BETWEEN THE ENDS OF THE EARTH



South America, a distance of 2,400 miles—passing over the Bermudas in good weather without stopping, as though they were not yet tired. Every year the golden plovers and turnstones migrate from Alaska to the Hawaiian Islands, a distance of 2,000 miles, with no stopping place between.

Perhaps even more remarkable than the distances traveled by these birds is the fact that they are able to find their way over the trackless expanse of the sea without landmarks to guide them. It is now believed, and has been rather definitely proved by experiment, that birds find their way over the thousands of miles of their migration routes back to the very spot where they nested the previous year by means of a sixth sense, a *sense of direction*, which is so poorly developed in man that he can scarcely appreciate its power in birds. An instinct for home, preferably the place of their own birth, is apparently the cause of their return year after year to the same region for nesting purposes.

## Migration Began in the Glacial Age

Many theories have been advanced to explain *why* birds migrate. Today birds are undoubtedly controlled entirely by instinct in their desire to migrate—an instinct which is closely associated with certain

physiological processes, like the enlargement of the reproductive organs in the spring and their reduction in the fall; and they migrate, just as they sing or build their nests, because they cannot help themselves. Most ornithologists believe that migration had its origin in the

desire, common to all organisms, to perpetuate their kind, to increase up to the limit of the food supply, and to occupy all available territory. Just as important as this impulse in stimulating their

migrations was the advance and recession of the great continental glaciers that, at one time in the remote past, covered a large part of the Northern Hemisphere, and made it during that period uninhabitable to all life. With the recession of this great sheet of ice, all this territory was again made available to the birds that had been crowded southward, and to those that had always lived in the tropics. During the period that the glaciers were receding and the birds were pushing north, the seasons were as pronounced as they are today, so that each winter the glaciers advanced a short distance and the

birds were pushed back, only to crowd forward again the following spring. The birds that were able to adapt themselves to this seasonal advance and retreat had an advantage over the others, and were the ones that eventually inherited all the territory available. Their comings and goings had by that time developed into an instinct which still carries many of them over thousands of unnecessary miles.

In the United States migration begins in late February, with a northward movement of the birds that have been wintering in the southern states; it continues until the last of May or the

first of June, with the passage of many species that have been wintering in South America. The height of the spring migration occurs about the middle of May. Fall migration begins the last of June or the first of July, with the flocking of blackbirds and swallows and the arrival from the north of a few shore-birds. The height of the fall migration comes during September, but it continues into November and even December. January is usually the only month when no migration occurs. Unusual weather may alter these periods somewhat.

The diagram shows the course followed by the Golden Plover in its annual migrations. In the spring it flies through the United States to its breeding grounds in the far north. When the time to go south comes, it moves eastward and then due south to the Argentine where it finds its winter home. In this flight it covers a stretch of 2,400 miles over water before reaching the northern limits of South America. This migration is exceeded in extent only by that of the Arctic Tern, which flies from the Arctic to the Antarctic.

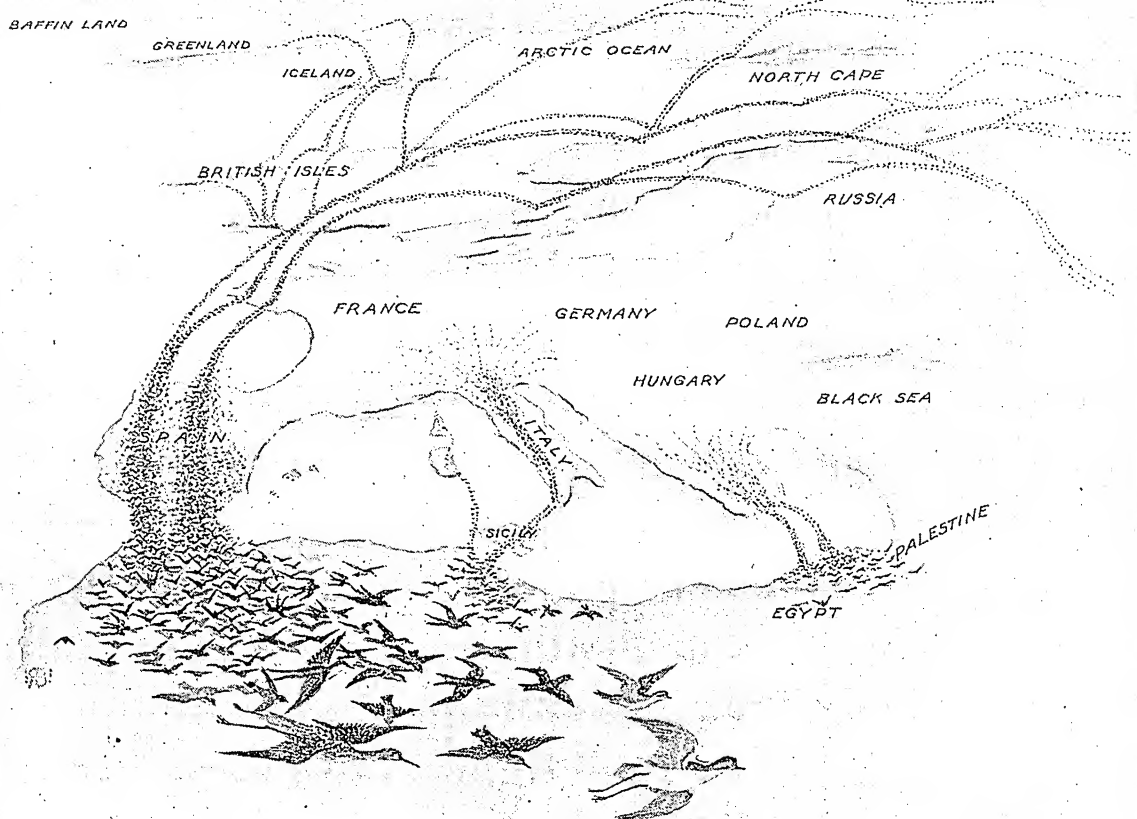


## THE LEMMINGS STOP FOR NOTHING!



One of the curiosities of nature is the way in which the Lemmings move in great swarms over Scandinavia. When they decide to migrate they start across country, ravaging crops on the way, swimming streams and climbing walls. They continue in their headlong course until they reach the sea, and even there they do not stop, but plunge in and perish.

## THE MIGRATIONS OF EUROPE'S BIRDS



The picture shows the principal routes used by European birds in the seasonal migrations. One of the marvels of bird life is the unflinching exactness with which the established routes are followed year after year, generation after generation. These long flights are kept up at prodigious speeds, ranging from 25 to 100 miles an hour.

Higher animals also afford many interesting examples of seasonal migration. Deer, goats, sheep, antelope, and the like, in many parts of the world, regularly leave the plains for the mountains in early summer to escape the flies, and to find new grass and safer solitudes. Then as the snow and cold increase on the heights in the autumn, they seek the valleys and the plains again.

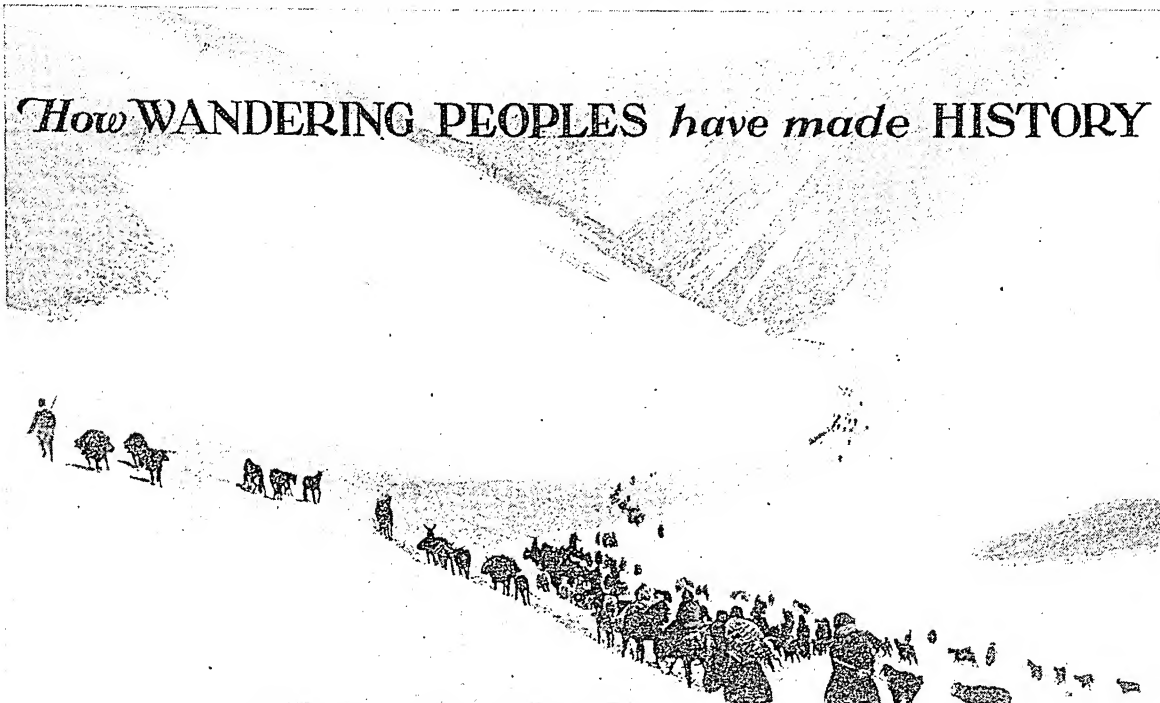
In addition to such seasonal migrations others of a more permanent character have occurred in the animal world. These may be compared to the "migrations of the nations" which sent the Angles and Saxons to Britain; and the Goths, Vandals, and other Germanic tribes wandering throughout the Roman Empire. We know, for example, that the invasions and retreats of great glaciers in prehistoric times led to extensive migrations of animals in Europe and America, during which the mammoth and mastodon disappeared from the earth (see Ice Age).

Less marked migrations of a non-seasonal character still occur from time to time, though not on so great a scale. Squirrels and field mice sometimes become so numerous that famine besets them and they overflow in tremendous armies into neighboring parts of the country, where most of them perish. A most remark-

able example is that of the Scandinavian lemmings, mouse-like animals of the mountains, which at intervals of from 5 to 20 years appear in enormous swarms in the cultivated regions of Norway and Sweden, working great havoc in farms and gardens. Undeterred by obstacles, these armies swim rivers and lakes, until they reach the sea, into which the little animals plunge to their death. No satisfactory explanation of their migrations has ever been found.

Many fishes and reptiles also perform long and complex wanderings, usually of the seasonal sort. In the spring there are great migrations of herring, salmon, shad, trout, mackerel, and other fishes from deep water to shallow, so that their spawn may be hatched in places suited to the needs of their young. Some turtles are said to migrate with considerable regularity. Some tropical crabs and even fishes have acquired the power of living out of the water for considerable periods, but they return to sea to deposit their eggs. Perhaps the most remarkable example of all is the eel, which is born in the Atlantic, migrates perhaps a thousand miles into the heart of Europe or America, where it spends its adult life, and then returns to the ocean depths to breed and to die. (See Birds; Eel; Fish.)

## *How* WANDERING PEOPLES *have made* HISTORY



Man has always been a wanderer since the dawn of time. Whole peoples restlessly pull up stakes and travel in search of food, safety, or adventure. Above we see the Baba Ahmedi tribe of Bakhtiari struggling across the mountain ranges of southern Persia, through cold and wind, to reach the green grass in the plateau of Iran and let famished herds feed. The photograph was taken when the memorable motion picture, 'Grass', was filmed in Persia by Merian C. Cooper and Ernest B. Schoedsack.

**M**IGRATION OF PEOPLES. Bees swarming from an overcrowded hive; locusts descending in hungry hordes upon fresh green pastures; wild geese sailing southward to escape the frozen lakes of the north—these mass movements in the animal world have their counterparts in the migrations of peoples that have repeatedly changed the course of history.

Migration sometimes occurs in great surges; sometimes in a slow thin stream. It may take place within the boundaries of a country when people move from one locality to another, or it may extend beyond native lands into distant countries. It differs from nomadic wanderings in being more permanent. Nomads drift about constantly and have no fixed abode; migrating peoples forsake one place only to establish themselves in another. Peoples such as the Plains Indians who roamed here and there to follow the wandering herds of bison, or the shepherd tribes of the Asiatic steppes who constantly move their households with their flocks to seek fresher grasslands, are nomads. But the exodus of the Hebrews from Egypt, their land of bondage, or the great westward movements from Europe to the New World were true migrations.

The impetus which starts a wave of migration most frequently comes from overpopulation. In a sparsely settled land the food supply is usually adequate and competition is not so keen. As population increases, the struggle for existence grows more difficult, and people, to escape hard times, are forced to migrate into other more favorable regions.

Migrations may also be necessitated by destructive climatic or geographical changes. The advancing ice-cap over northern Europe in glacial times drove man southward (see Ice Age). Floods, continued drouths, erosion, and other forces of nature have ruined large areas and caused the residents to migrate.

Again, the attraction of another place may be so strong by reason of its climate, its wealth, or its opportunities for adventure or initiative, that people are lured to it, impelled by the wish to grasp a good opportunity. Such motives started the great trek to California in the days of the covered wagons, and the mighty gold rush to the Yukon.

Finally, the desire to gain freedom from political, social, or religious oppression inaugurated migrations like those of the Pilgrims in the *Mayflower*, the Huguenots from the shores of France, and the recent political refugees from Europe.

### The Course of Migrations

Other things being equal, migrating peoples usually move into areas that enjoy a climate and often other physical features rather similar to those of the home country. Adjustment to the new environment is thereby more easily accomplished. East to west has been the course of most of the great migrations in the history of mankind.

Migratory movements generally follow the lines of least resistance along natural routes determined by topographical conditions. Population moves along coastal plains and river valleys rather than over mountains and through deserts. This spread along



nature's highways is especially evident in the early settlement of America (*see* American Colonies).

The wanderings of prehistoric man gradually took him from his place of origin, which scientists tell us was probably in central Asia, to nearly all parts of the world except the Americas. The Stone Age culture spread into western Europe, first around the Mediterranean and up the Atlantic coast, then inland by means of the river valleys. Long residence in diverse widely separated regions brought about a selection of physical characteristics, and man became differentiated into races (*see* Races of Mankind).

#### Migrations in Ancient History

At length, in regions favored with water, rich soil, and a mild climate, all conducive to agriculture and the support of large numbers in comfort, men began to live together in communities or towns. The first of these grew up along the banks of the Nile in Egypt, and in the valley of the Tigris and Euphrates in Mesopotamia. This civilization lasted about 3,000 years, and was finally wiped out by a great migration of energetic shepherd folk from the grasslands bordering the Caspian Sea. We call these people Indo-Europeans because they flocked into both India and Europe. They became the immediate ancestors of the present white inhabitants of Europe and America.

The Indo-European parent people pushed out branches in several directions. A group of tribes swept southeast to the plateau of Iran, from which they were named "Aryans." This group later split up into two: one developed the great empire of the Medes and Persians, the other colonized India. Meanwhile another group of Indo-Europeans advanced across the Aegean Islands into the rocky peninsula of Greece, where they finally became the torch-bearers of civilization to Europe. Not long after, others invaded the Italian peninsula and founded the empire of Rome. Some tribes swung southward, coming into collision with the Semites, whom they drove into Arabia and Africa. Others spread northward over the plains of Russia and became the Slavs, while those who went up the valley of the Danube River became the Celts, later followed by the Teutons who settled around the Baltic.

That all these migrant peoples were related to each other is known by the key of language. When scientists find a word running through many languages, they assume that the people who use it have had a common origin. (*See* Philology.)

These migrations from Asia did not all come with the same rapidity. They were irregular, and sometimes required centuries to accomplish. But new conditions brought about changes in habits, customs, industry, and ideas. The young and vigorous peoples, who came into Europe wave after wave, developed new and different civilizations by the combination of one set of customs with the different customs of other people. It was this intermingling of civilizations that speeded up recent progress. (*See* Civilization.)

For more than a thousand years Greece and Rome were the center of Indo-European culture. In time

Rome became overpopulated and was driven to secure more land by conquest. She had also to protect herself against invading barbarians. So it was that Roman legions extended the sway of the empire over all of Europe, subjugating Greece and the countries round about the Mediterranean. At the beginning of the Christian era Rome was mistress of the whole of what was then the civilized world.

But whenever a country grows old and prosperous it decays and becomes easy prey to envious and vigorous migrants. During the 5th century A.D. came the great migrations of the Goths, Vandals, Alemanni, Franks, and others—barbarous tribes living in eastern and central Europe. Stirred into activity by inroads of Huns from Asia, they began to flood the civilized world, and put an end to the supremacy of Rome. Out of the break-up of the Roman dominion appeared the kingdoms and nations that gradually gave rise to modern Europe. (*See* Middle Ages.)

#### Migrations in American History

With the discovery of America by Columbus, European migrations began on a larger scale than ever before, and the era of world-wide exploration which followed opened up new lands that were soon colonized with feverish activity by the white race. The American continent was already inhabited by Indians, people who had migrated from Asia at some unknown time. But the country was large, with rich natural resources, and not densely populated except in Mexico. It offered European nations plenty of room.

Early migration from Europe to America came chiefly from Spain and England. English settlers went to the central seacoast of North America, and the Spanish to the southern part and to South America. It took two centuries to fill up the coastal plain east of the Allegheny Mountains, which formed a barrier to the west. Finally the westward march began, along the Great Lakes, down the Ohio, the Tennessee, and the Cumberland rivers, and up the tributary valleys. By the end of the 19th century the stream of immigration had penetrated every part of the country, and the number of newcomers swelled to a million a year until the World War of 1914-1918 (*see* Immigration).

#### Forced Migration of Refugees

But these voluntary migrations were soon overshadowed by the forced migration of refugees in Europe and the Near East during the upheavals of the World War and the years that followed. Creation of new nations, boundary revisions, new forms of government, and exchange of populations (usually racial minorities) uprooted some 3,500,000 people. To help resettle them, the League of Nations established the Nansen International Office for Refugees.

Again in the 1930's and 1940's, political persecution, territorial annexations, and wars in Europe and Asia drove millions from home. In some instances large areas were "evacuated" by government command; and "repatriation," chiefly by Germany, moved thousands from neighboring nations back into their motherlands. (*See also* China; Europe; Jews; Tyrol.)

**MILAN** (*mī-lān'*), ITALY. More than any other city in Italy, Milan today sums up the spirit of the Italian people, their strength and weakness, their sufferings and triumphs, their storied past and their modern development. Standing on the Olona River in the midst of the fertile plains of Lombardy, Milan from the earliest days was the natural axis around which turned the stirring history of northern Italy.

This position, which placed the city in the path of invaders armed with fire and sword, also made of Milan the gateway for commerce and prosperity, and while the need of strong and constant self-protection developed courage and independence in the Milanese, they also waxed rich and powerful.

Milan today is the center of the financial life of Italy, the second largest city in the kingdom, and a great industrial center. Ever since it was taken from the Gauls by the Romans in 222 B.C. Milan has continued to grow despite the fact that it was sacked and burned once by the Huns, twice by the Goths, and once by Frederick Barbarossa as late as 1162.

Because of these repeated ravages, Milan has almost no relics of Roman or medieval days; but the world-famous Milan Cathedral rises like a brilliant white crown above the heart of the city (see Italy, page I-163). Another great church of Milan is that of Sant' Ambrogio (St. Ambrose), built by this saint in the 4th century, but twice destroyed and rebuilt. Here St. Ambrose baptized St. Augustine, and here also early emperors and kings were crowned with the "iron crown" of Lombardy, so called from its iron circlet, said to be made of a nail from the crucifixion. Near it is the former convent of Santa Maria delle Grazie, where Leonardo da Vinci's famous painting 'The Last Supper' appears on the refectory wall.

Milan has always been a seat of art and learning. Its artistic and literary life centers about the Brera Palace, the home of the Academy of Fine Arts and Science. Its fine picture gallery contains paintings by Raphael, Titian, Van Dyck, Veronese, Tintoretto, Bellini, Carpaccio, and many other famous artists. The city also has two famous libraries, a university, a school of commerce and agriculture, the great Scala Theater, a fine academy of music, and a celebrated archeological museum.

Splendid as are these treasures of art and architecture, however, Milan can not compare in these respects to Florence, Venice, or Rome. It is as a commercial center that Milan leads Italy. In the smart glass-roofed streets of the Galleria Vittorio Emanuele, merchants of all nations talk busi-

ness, manufacture, and exports, in a medley of languages. This famous Galleria is a great arcade in the form of a cross, the octagon in the center being crowned with a glass cupola 160 feet high. Its streets are roofed with glass at a height of 94 feet, and it serves as an elegant "parlor" for the city.

Milan leads in manufacture of textiles, especially silks and rayon, likewise in weaving linen and wool. Other important manufactures are locomotives, turbines, metal bridges, railway trucks, boilers, motors, pumps, rubber goods and electric cable, surgical and musical instruments, dynamos, bicycles, automobiles, chocolate, and chemicals. The city's industrial importance was strikingly shown in the second World War, when the British air force risked the hazardous flight over the Alps in order to bomb it.

Milan is one of Europe's most modern cities. In the decade before the second World War, it built a huge new railroad station and an airport for sea and land aircraft. New wide streets speed traffic, and construction of buildings a hundred feet high is permitted, very tall for Italy. Population, about 1,115,000.

After Milan had been rebuilt following its destruction by Barbarossa, the city suffered a century of civil strife. It then fell under the rule of the house of Visconti. The last Visconti duke died in 1447 and three years later began the rule of the Sforzas, continuing to 1535. Most of the ancient beauty of the city is due to these two famous houses. When the Sforza line died out, Spain seized Milan and held it until 1714. The city then fell to Austria and remained under Austrian rule until Napoleon created his shortlived Kingdom of Italy and made Milan its capital. After Napoleon's fall in 1815, Milan was restored to Austria. In 1859 it became part of the United Kingdom of Italy.

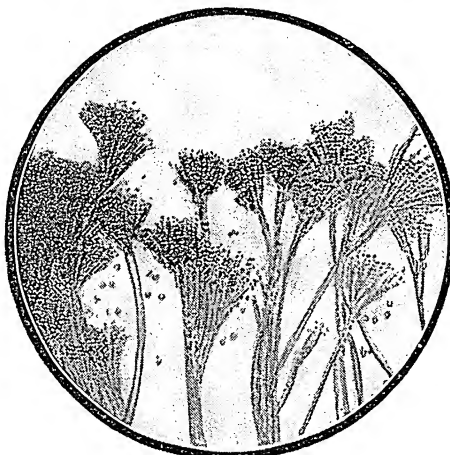
**MILDEWS AND MOLDS.** We frequently find small downy or velvety patches called mildew or mold on

the surface of leaves, fruit, damp cloth, moist foodstuffs, etc. Sometimes the growth covers a large area, with a film of soft cottony tissue, very thin. By using a powerful magnifying glass we can see that the growth is composed of a great number of tiny plants, so small that separately they cannot be seen by the naked eye. If we use a compound microscope we can see the structure of these tiny plants, and we discover that their thread-like bodies cover the surface on which they grow with a network of delicate cobweb-like strands or filaments.

Mildews and molds are one of the divisions of the *fungi*, which include toadstools, mush-

rooms, and many microscopic plants. Like all fungi, they are either parasites, living upon the bodies of other plants larger than themselves, or saprophytes, living upon dead vegetable and animal matter.

DELICATE STRUCTURE OF BLUE MOLD

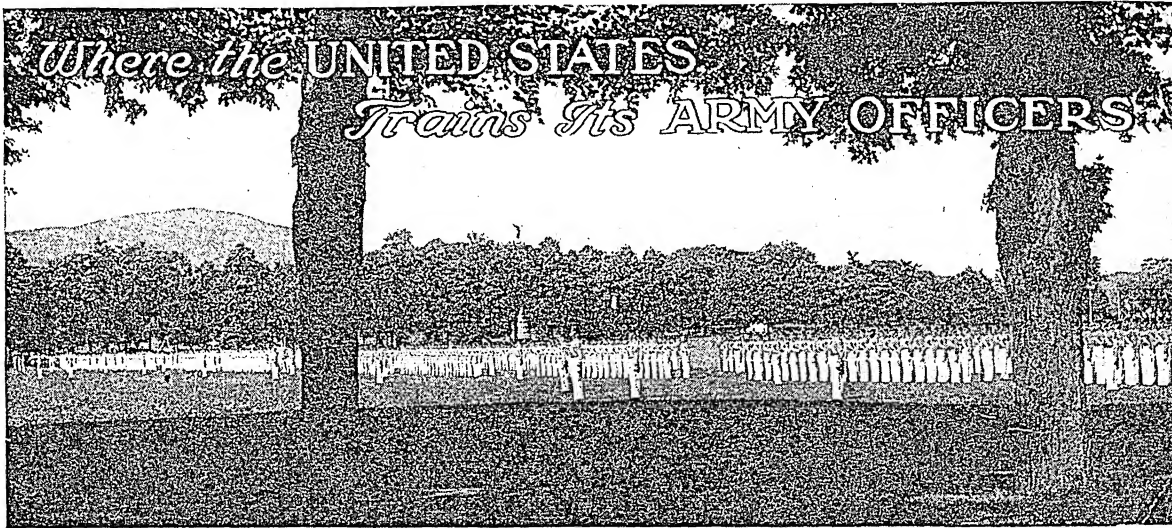


When bread becomes moldy you throw it away with disgust. But if you were to examine it under a microscope you would find the dark mass consists of tiny delicate plants like this.

"Downy mildews" usually grow within the tissues or cells of plants, and thus do a great deal of harm to the stems and leaves, drying them up and making them curl and twist. One of the best known of these is the grape mildew, the larger part of whose thread-like body grows within the grape leaf, and sends out upon the surface masses of fibers which appear to the naked eye as small white patches. These patches generate tiny spores, invisible to the naked eye, which are carried by the wind to other leaves where they take root and grow into new mildew plants.

Powdery mildew can be removed from plants by dusting them with sulphur powder, or spraying them with some good "fungicide," or liquid used for killing fungi (*see* Spraying). The spores of green and black mold exist in the air almost everywhere. That is why damp bread and other food left standing in kitchens will almost always become covered with a furry green coat. To protect food from these molds, it should be kept in dry airy places.

Scientific name of true mildews, *Ascomycetes*; false or downy mildews and black molds belong to the *Phycomycetes*.



No matter how fine their own armies, foreign visitors never fail to express astonishment over the machine-like precision of West Point cadets on parade. After looking at this picture — those long files of cadets in dress uniform, each file as straight as a string, each man standing like a statue — you can easily understand why visitors are impressed. The same perfection is retained throughout the most complicated drills. The cadets move with a precision that merits the opinion often expressed of them — "West Point cadets are the best drilled body of men in the world."

**MILITARY ACADEMY, UNITED STATES.** The band at the Military Academy at West Point, where young men are trained to be army officers, strikes up a stirring march. Down the grassy parade ground swing the long gray lines of erect cadets, with their rifles at "shoulder" glistening in the sun. Their dark high "tarbucket" hats, bearing jaunty pompons and emblazoned with the Academy crest, are held rigid by black chin-straps. Across their short gray tailed blouses, adorned with glittering gold "bell" buttons, they wear two white cross-belts extending diagonally over their shoulders to their waists. Their trousers are white, spotless, faultlessly creased.

With spirited perfect step they advance, every man gazing straight to the front, chest out, chin in. So evenly do the white-gloved hands swing, so straight are the ranks, so exact is every movement, that these hundreds of youths seem like one great machine.

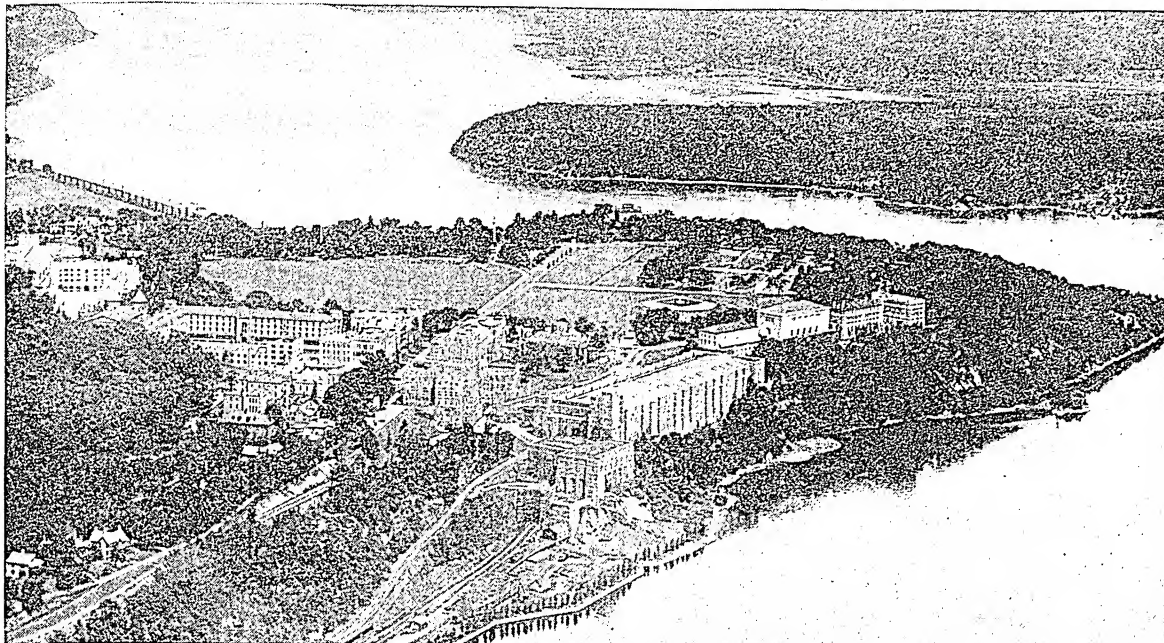
Such amazing precision and efficiency are the result of the strict mental and physical discipline, whose Spartan rigor is impressed upon the new man from July 1 in his first summer at the Academy when he and his roommate are shown to their bare, rugless, pictureless little room in Cadet Barracks.

Soon after his arrival the new cadet dons a uniform of gray, black-banded cap, gray shirt, and gray flannel trousers. This is similar to the regular uniform he later will wear daily, consisting of short tight-fitting gray coat, the black collar-band of which buttons tightly around the neck, and gray trousers with black stripes down the sides. Promptly he begins under the supervision of officers the hard period of drills which are planned for the two months of summer.

On September 1 he begins in earnest his stern schooling. Almost every minute of a West Pointer's life is occupied according to rule. The lazy man has no chance here, for the entire régime is severe—more severe than in the military academy of any other country. During his first year—as a "Plebe"—he studies mathematics, English, French, and practical military engineering (surveying). During his second year—as a "Yearling"—he studies mathematics, English, French, political history, drawing, practical military engineering, and tactics. At the end of his second year he is given a furlough or vacation of two months. During his third year—as a Second Classman—his studies include natural



## AN AIRPLANE VIEW OF WEST POINT



Here is the beautiful group of gray Gothic buildings on the Hudson, about 50 miles above New York, where the Army trains its officers. Ever since its establishment at the beginning of the 19th century, West Point has furnished a large proportion of the officers of the regular Army and has impressed its spirit and traditions on the entire service.

and experimental philosophy, chemistry and electricity, Spanish, and military hygiene. During his fourth year—as a First Classman—he studies military art and history, military engineering, law, ordnance and gunnery, and economics and government. During the summers following “Plebe” year and Second Class year, cadets receive practical instruction in military exercises and maneuvers in a regular camp.

During the second World War flying instruction was added.

At the end of the four years, cadets who have met all the high requirements are graduated as second lieutenants in the regular Army and receive the Bachelor of Science degree. The regular four-year course may be shortened in time of crisis.

The Military Academy of the United States was founded by Act of Congress in 1802, and it is directed and supervised by the War Department. Beautifully situated, it is one of the greatest military schools in the world. The impressive Gothic buildings with

their castle-like towers and turrets stand on a lofty promontory 180 feet above the Hudson River, which here breaks through the Highlands in a winding gap.

The normal authorized strength of the corps of cadets is 2,496. Four are appointed from each congressional district, 4 from each territory, 8 from each state at large, 6 from the District of Columbia, 172 from the United States at large, 4 from Puerto Rico, and 2 from the Canal Zone. The president may appoint 180 from enlisted men of the Army and National Guard. All applicants must be single, 17 to 22 years old. They must agree to serve in the Army four years after graduation and must pass entrance examinations or present a certificate showing the equivalent of a thorough high school education. A

cadet's pay, plus “commutation of rations,” is more than enough to cover all necessary expenses at the Academy. Indeed, the time of the cadets is so well filled that there is little need to spend money for “extras.”

5:50 A.M.—The reveille gun, bugle, and drums.

6:20—Police call. Cadets must sweep their own rooms, fold their bedding, and leave everything exactly in prescribed order.

6:30—March in ranks to breakfast.

7:15—Call to quarters. Cadets remain in their rooms to study when not attending recitations. Alternate recitation and study periods now precede the march to dinner at 12 o'clock, and follow it until 3 o'clock.

3:15 P.M.—Mon., Tues., Thurs., and Fri.—Drills, alternating with supervised athletics. Varying according to classes and to seasons, these include infantry, cavalry, and artillery tactical drills; standing gun, siege battery, and sea coast battery drills; signal, and pickets and advance guard drills; target practice; field engineering; construction of temporary bridges; riding, fencing, boxing, wrestling, swimming, dancing, gymnasium, and the essentials of such athletic games as football, baseball, lacrosse, soccer, tennis, basketball, and hockey.

4:15—Recall from drill.

4:45—Parade. After parade, at 6:20, the cadets march to supper, and half an hour after supper the evening period of study begins, lasting until 9:30.

9:30—Tattoo (prepare for bed).

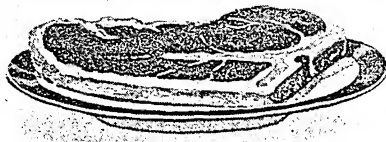
10:00—Taps (lights out; inspection).

West Point, the "Gibraltar of the Hudson"—about 52 miles north of New York City—was of great strategic importance in the early history of the country. During the Revolution it was fortified partly under the direction of the Polish patriot and engineer, Kosciuszko, to whom the cadets have erected a monument by subscription. Benedict Arnold was bargaining to betray its fortifications to the British when the capture of Major André defeated the plot. Washington made his headquarters at West Point for a time, in 1779. The ruins of old Fort Putnam and other fortifications of Revolutionary fame are still to be seen.

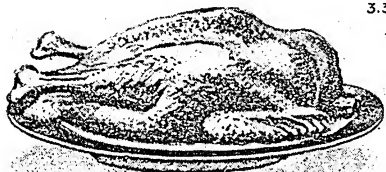
**MILK.** Every human being lives for a time entirely upon milk. Indeed, milk is the chief food of all the higher animals or mammals during babyhood, for the food elements needed to build and nourish brain,

Among English-speaking people, the cow furnishes by far the largest share of the milk supply, but the Laplander drinks the milk of reindeer, the Bedouins of the desert get their milk from the camel, and the roving Tatar drinks mare's milk. Sheep, goats, asses, buffaloes, and even zebus contribute, in one region or another, to the world's milk supply. Goat's and ewe's milk is rich in fats and is used in making some of the most famous European cheeses. The raising of milch goats is a prominent industry in Switzerland, and is being encouraged in England and the United States. Their freedom from disease makes goat's milk especially safe for feeding infants and invalids.

### WHY MILK IS A CHAMPION AMONG FOODSTUFFS



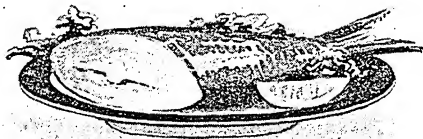
4/5 lb. of Beefsteak



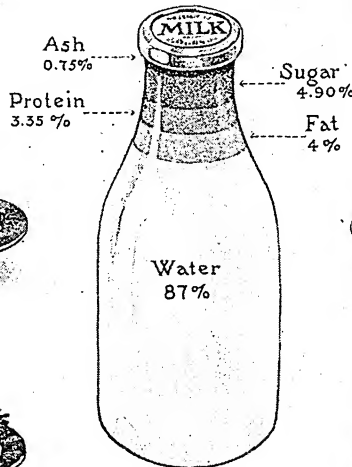
1 1/4 lbs. of Chicken



1/2 lb. of Ham



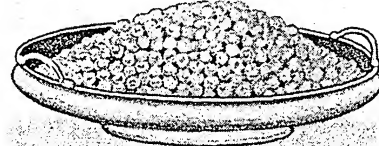
2 1/3 lbs. of Codfish



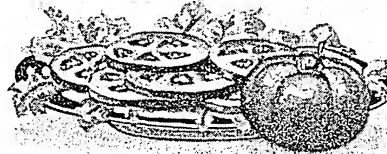
8 average size Eggs



1 1/4 lbs. of Beans



2 2/3 lbs. of Peas



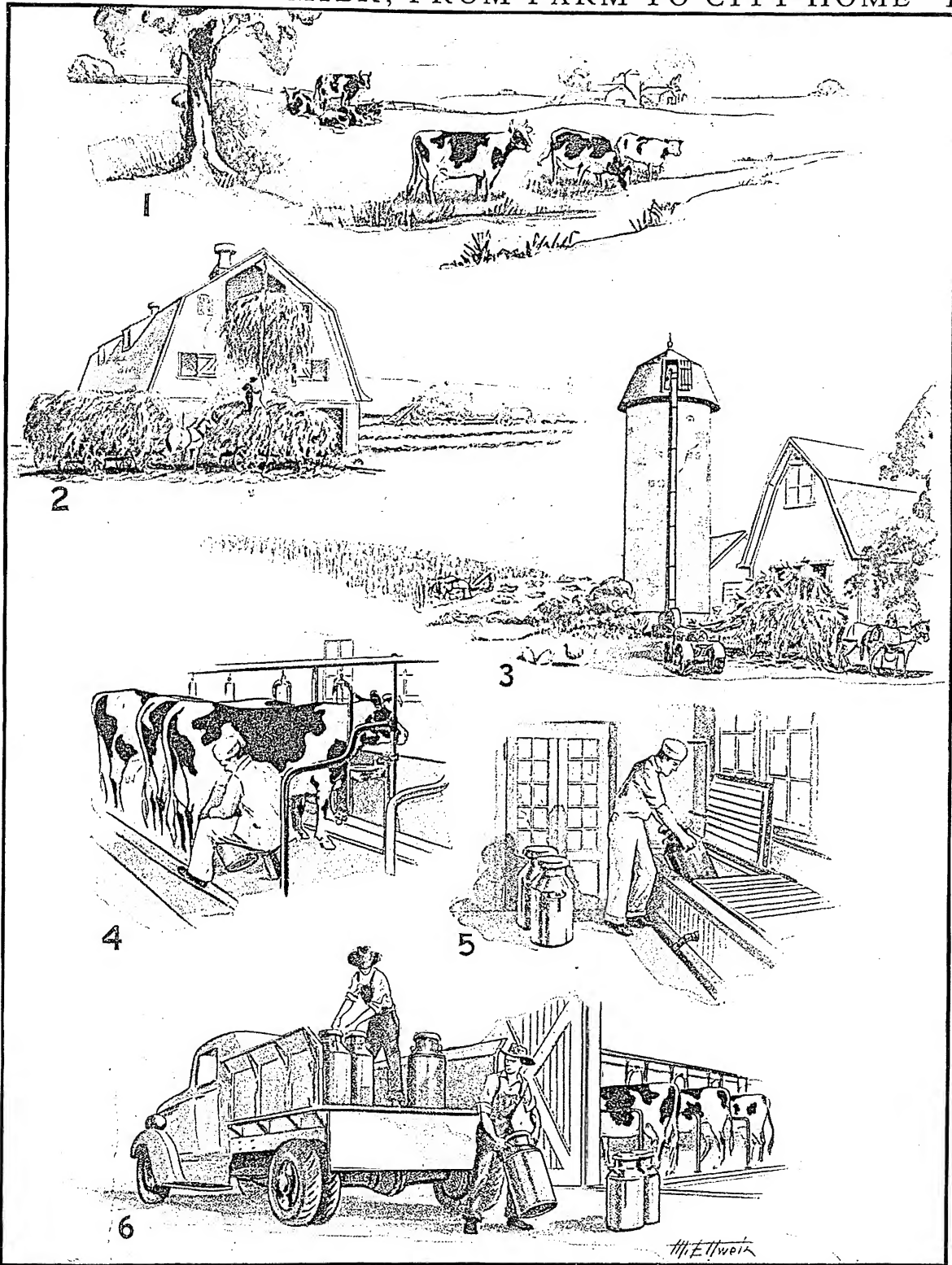
6 2/3 lbs. of Tomatoes

We see here what quantities of other foods are needed to match a quart of milk in general food value. We note from the picture that milk is divided into water and food solids. We note, too, the abundance of milk sugar and fat. These are among the most valuable of all our "body fuels," because they are readily absorbed by our tissues to give us heat and energy. In addition, milk sugar stimulates the growth of intestinal bacteria, which aid digestion. We also find protein and ash (mineral salts). Their value is explained elsewhere in this article.

muscle, and bone are found in milk in the most easily digested form. There is no substitute for milk in infant feeding, and milk and milk products are most important foods at all ages. Authorities tell us that in families where there are as many children as adults, as much money should be spent for milk as for meat.

But whatever its source, all milk—animal as well as human—contains the same valuable food elements, though in different proportions. In good cow's milk there is about a quarter of a pound of food solids to every quart—as much as in three-quarters of a pound of beef. The most important of these solids are:

# THE STORY OF MILK, FROM FARM TO CITY HOME—1

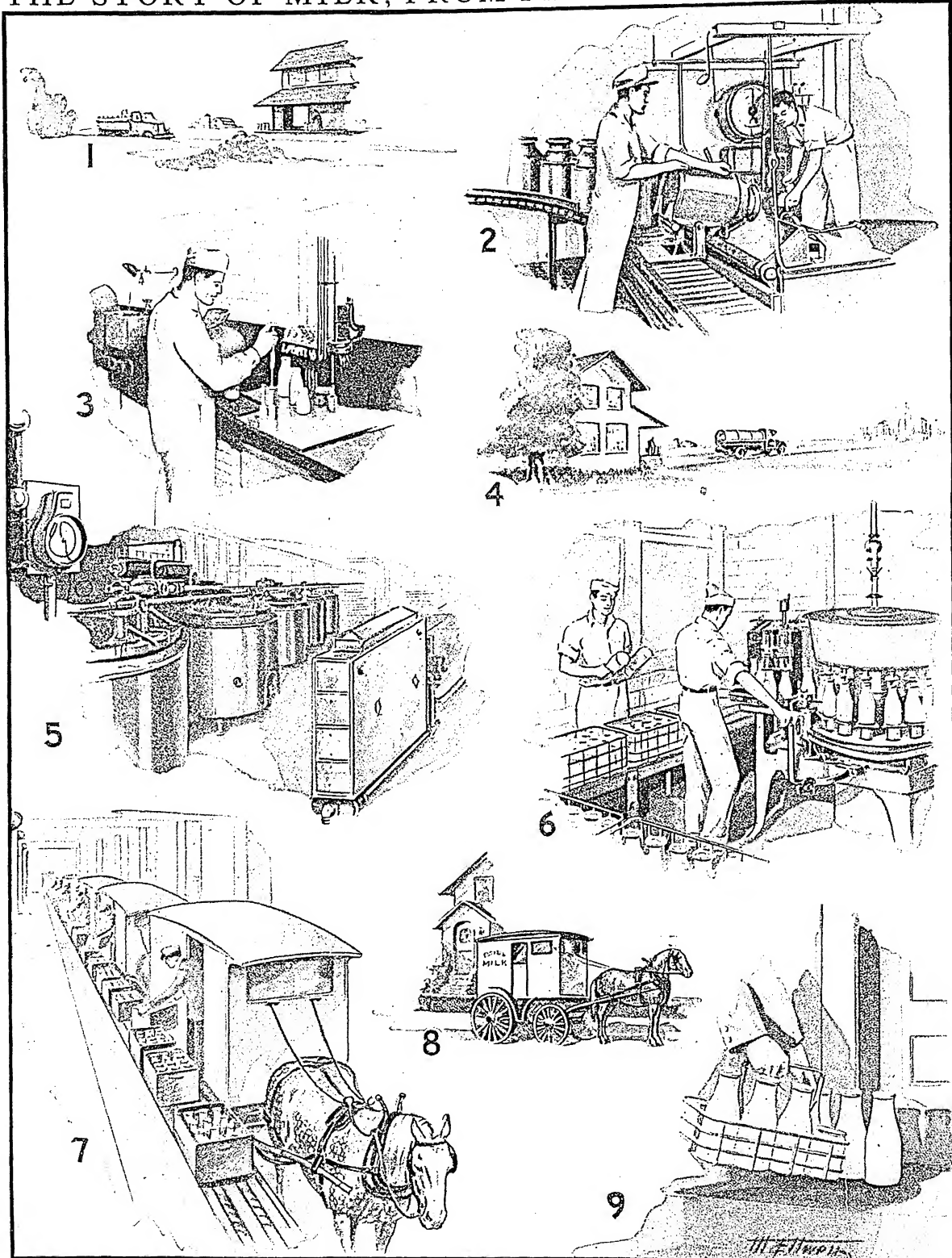


On this page and the next, the story of how city people get their milk is told step by step with pictures. 1. We begin with a herd of cows feeding on summer grass in the pasture of a dairy farm. 2. Here the farmer is putting hay in his barn to feed his cows during the winter. 3. Many farmers plant corn and cut it while it is still green, then store it in a silo for winter feed (see Silos).

4. Morning and evening the cows go to their stalls to be milked. On most farms they are milked by hand, as we see here. On some farms milking machines are used (see Dairying). 5. The milkers strain the milk into sterilized cans, which are then stored in the cool milk house. 6. Once a day the farmer loads the cans on a truck and sends them to the country receiving station.



# THE STORY OF MILK, FROM FARM TO CITY HOME—2



1. Here we see the milk truck arriving at the country receiving station of a dairy company. 2. The milk is poured into a weighing machine. 3. Next, it is tested for butter fat. Most dairy companies pay the farmer according to the weight of the milk and its richness in butter fat. 4. The milk now goes to the city by train or in big tank trucks. 5. At a city plant the milk is filtered again, pasteurized, and cooled. 6. Next, it is bottled and capped by machinery, and sent out to the loading platform. 7. There the milkmen load it on their trucks or wagons. 8. Horses and wagons are used where there are many stops in crowded cities. For long-distance deliveries autotrucks are employed. 9. And finally the milkman delivers the cool milk at the customer's doorstep.

(1) butter fat; (2) curd or casein, a protein, which forms the body of cheese; (3) milk sugar (lactose), a carbohydrate, which is not so sweet as cane sugar; (4) ash or mineral salts, notably calcium phosphate. Each mammal has these foods in its milk in the proportions best suited to the needs of its own young. Therefore the best food for the human baby is its mother's milk. If other milk is substituted, it is commonly modified with milk sugar and water.

Milk is the hardest food to replace in the diet because few other foods contain much calcium. This is needed to build bones and teeth. The mineral phosphorus, another bone builder, is also present in milk, but there is little iron, which is needed for blood. Iron may be supplied by adding vegetables to the diet. Milk is rich in protein, a builder of muscle, and in vitamins, notably A and G. Its vitamin D content is increased by irradiation (*see* Vitamins).

#### The Many Milk Products

The articles on Butter, Cheese, and Dairying tell about the most familiar milk products, including ice cream. But there are many others. Evaporated milk is made from whole milk by drawing off about 60 per cent of its water in vacuum pans. The thickened milk is then forced through a machine called a homogenizer. This breaks up the fat globules into minute particles, which remain distributed throughout the milk. Finally the milk is sealed in cans and heated to 240° F. to sterilize it. Condensed milk differs from evaporated milk in that condensed milk is not run through a homogenizer nor is it sterilized. Sugar is added to preserve it. In making powdered or dried milk, the heating is continued until nearly all the water is evaporated. The thickened milk is then sprayed into hot air so that it falls as a fine powder. Malted milk is a powdered preparation made of whole milk, barley malt, and whole wheat. Besides taking up less room than fresh milk in storage and shipment, evaporated, condensed, powdered, and malted milks can be kept indefinitely and shipped long distances.

In making cheese, a thin watery serum, called whey, remains after the removal of casein from milk. Whey is rich in milk sugar, which can be utilized in the making of infant foods and "sugar-coated" pills.

There are many fermented milk drinks. A favorite is buttermilk. This residue from buttermaking has a tart taste because bacteria have changed the sugar into lactic acid during fermentation. True buttermilk, however, is being replaced in many diets by cultured buttermilk, which is whole milk fermented by adding lactic acid. Acidophilus milk has as its fermenting agent a bacterium ordinarily present in man's intestines. Kumiss, an effervescent drink of the Tatar tribes, is mare's milk fermented with yeast. A similar drink, kefir, is made from cow's milk.

#### Papers, Paints, and Plastics from Milk

Milk supplies the United States annually with millions of pounds of casein for use in the industrial arts. After being extracted from milk, the casein is washed, dried, and pulverized. Most of it is used

to give a smooth coating to magazine, book, and wall papers. Much is used for making paints and glues, and for preparing plastics resembling ivory, out of which buttons, billiard balls, combs, and similar objects are made. In recent years, artificial wool has been made from casein (*see* Wool).

**MILKWEED.** The members of the milkweed family are well fitted to make their way in the world. Their stems contain a sticky, milky juice—bitter and, in some species, poisonous. This protects them from many grazing animals. The flowers have special attractions for bees and trick them into helping fertilize the blossoms. And the seeds are equipped with

#### THE MILKWEED AND ITS FLYING SEEDS



The large picture shows the common milkweed with its clusters of buds and blossoms. At the right, a bursting pod is releasing its fluffy seeds.

plumelike tufts so that the wind can distribute them far and wide. Moreover, milkweeds are perennials; that is, once they get a start, they grow from the same roots year after year.

Perhaps the best-known species is the common milkweed, found from Canada to North Carolina and west to Kansas. It thrives in fields and along roadsides. The stem, from 2 to 5 feet tall, is thick and sturdy. The great coarse leaves are smooth above and hairy beneath, 4 to 8 inches long, and 2 to 4 inches wide. From July to September, the milkweed has ball-like clusters of small flowers, greenish-white in some varieties and dull pink to purple in others.

In each blossom there are five colored horns filled with nectar for the bee visitor, which unwittingly repays the milkweed by fertilizing its flowers. For, as the bee sips nectar, its hind foot slips into a slit containing sticky pollen masses, which cling to its leg. Flying to the next blossom it carries with it the fertilizing pollen. Occasionally a bee is unable to extricate its foot from the slit and dies among

the nectar horns. In the autumn the flowers develop into spindle-shaped pods. When these pods dry, they crack open and give to the wind fluffy clouds of silk with flat brown seeds clinging to them.

The silk, or floss, is actually a fine, cellulose tube with air sealed inside. Because of this it is extremely light and a good insulator. Thus it can serve as a substitute for kapok (see Kapok). Like the cotton fiber, however, it is too short and slippery to be spun into thread or woven into cloth. The stalk of the plant contains a fiber nearly as strong as Manila hemp. The seeds yield oil similar to soybean oil and when dry make good live-stock feed. Milkweed flourishes where grass will not grow, and its seven-foot roots bind the soil. With promise of cash return, farmers are now growing milkweed on otherwise useless parts of their land.

Milkweeds belong to the family *Asclepiadaceae*, comprising about 2,000 known species, most of which occur throughout the world's tropical and warm temperate regions. Scientific name of the common milkweed, *Asclepias syriaca*. The swamp milkweed, *Asclepias incarnata*, with attractive clusters of rose-purple flowers, is sometimes used in gardens. The butterfly weed, *Asclepias tuberosa*, is so called because the larva of the monarch butterfly feeds on its leaves. Butterfly weed is sometimes called pleurisy root because the root has been used to combat chest ailments.

**MILLAIS** (*mī-lā*'), JOHN EVERETT (1829-1896). When, in 1839, the Duke of Sussex presented the prizes offered by the Society of Arts in London, he called the name "John Everett Millais." He looked around for the man who would answer to that name and remarked, "The gentleman is a long time coming up." Someone told him that Mr. Millais was already there. Peering down, he saw to his amazement a slight golden-haired boy not yet ten years old—the winner of the silver award for a large drawing, 'The Battle of Bannockburn'.

The success which came to him so early followed Millais all through his life and he was spared the hard struggle for recognition that marks the lives of most artists. He was born in Southampton, England, June 8, 1829. A few years after his birth the family removed to Jersey and in 1835 to Brittany, where he began sketching in earnest. His mother, from whom he received his early education, became convinced that her son had unusual artistic gifts. Her judgment was confirmed by the president of the Royal Academy in

London, and the young genius was placed in a preparatory art school for two years. At the age of 11 he was admitted to the schools of the Royal Academy, and in 1847, his last year at the Academy, he won the gold medal for his historical painting, 'The Tribe of Benjamin Seizing the Daughters of Shiloh'.

#### The Pre-Raphaelite Brotherhood

The following year Millais, with two friends, Holman Hunt and Dante Gabriel Rossetti, organized the Pre-Raphaelite Brotherhood dedicated to a rebellion against the artificialities of the art of the day (see Painting; Rossetti, Dante Gabriel). Millais's love of realism expressed itself at first by great attention to the detail of his work, but after 1860 he developed a more free and vigorous style.

Millais in 1855 married Euphemia Gray, who had previously had her marriage to John Ruskin annulled. In February 1896, he was elected president of the Royal Academy, the crowning triumph of his life. He died Aug. 13, 1896, and was buried in the Painters' Corner in St. Paul's Churchyard.

Among Millais's hundreds of paintings, some of the most noted are: 'Ophelia' and 'The Huguenot' (1852), 'The Vale of Rest' (1858), 'The Boyhood of Raleigh' (1870), 'The North-West Passage' (1874), 'A Yeoman of the Guard' (1877), 'The Princes in the Tower' (1878). In his landscapes ('Chill October,' 1870; 'Halcyon Weather,' 1892) and in his black and white illustrations for Tennyson's poems and the parables of the Bible, Millais revealed the same acute vision, sincerity, and skill that were shown in his portraits.

**MILLAY**, EDNA ST. VINCENT (born 1892). In her brilliant career, Edna Millay has written verse in many different veins and of varying excellence. At her lightest, she has written almost flippantly; at her most intense she has produced some of the most beautiful sonnets and lyrics of our time.

Edna Millay was born Feb. 22, 1892, in Rockland, Me. Her family knew the pinch of poverty, yet it had the courage to make much of small things. Her mother bore the responsibility of caring for the three daughters, and had to work out as a practical nurse. Edna, the eldest, was often left in charge of the home—a responsibility that rested strangely upon her care-free, gipsy-like nature.

While still a child she began to write verse, most of it for the little plays and songs that the three girls made up for themselves. When she was 14, one of her poems won the gold badge of the *St. Nicholas* maga-

'A YEOMAN OF THE GUARD'



Millais depicts here the traditional dignity and picturesque costume of the men who have acted as the English Royal Household Guards since the year 1500.



zine, and when she graduated from high school in Camden she won first prize with an essay in verse. At 20 she had completed her first long poem, 'Renascence', and while at Vassar she took a prize in the Intercollegiate Poetry contest. She was graduated from Vassar in 1917 with an A.B. degree.

That same year Miss Millay went to live in Greenwich Village, New York City, and was an early member of the talented group, the Provincetown Players. She acted in their theater on MacDougal Street, and also wrote plays for them, notably 'Aria da Capo', a satire on war which still retains its freshness and power. Other plays of hers are 'The Lamp and the Bell', 'Two Slatterns and a King', and the remarkable libretto, 'The King's Henchman', which she wrote for the opera of that name by Deems Taylor. This was produced in the Metropolitan Opera House in 1927.

Miss Millay married Eugen Jan Boissevain in 1923, and her home in the United States ever since has been a farm in the Berkshires called "Steepletop." She and her husband often travel abroad together, and of recent years she has given many lecture-readings around the country. She is small and delicately made, but, for all her seeming fragility, she has an ardent and fiery spirit. Her hair, a carrot-red in youth, is now coppery gold.

Edna Millay's principal works, with dates of publication are: 'Renascence' (1917); 'A Few Figs from Thistles' (1920); 'Second April' (1921); 'The Harp-Weaver' (awarded Pulitzer prize, 1923); 'The Buck in the Snow' (1928); 'Fatal Interview' (1931); 'Wine from These Grapes' (1934); translation of Baudelaire (with George Dillon, 1936); 'Conversation at Midnight' (1937).

**MILLET** (*mē-yā*'), JEAN FRANÇOIS (1814-1875). "Wake up, my little François; you don't know how long the birds have been singing the glory of God!" It is a lovely spring morning in Normandy. An old French peasant woman bends above a child, coaxing him from dreams with reports of the wide-awake world out of doors.

Amid scenes like this the great peasant-artist Millet spent his early life; and the love of nature that in later years he put on canvas was the priceless gift of his wise old grandmother. The parents of Millet were farmers—intelligent, pious people, who in the midst of their toilsome life filled their home with love. While the father and mother worked in the fields, the grandmother cared for the children. Her teaching became one of the greatest influences in the life of this artist.

Engravings in the family Bible early awoke in the lad François a love of drawing, but at that time he had little chance to gratify this taste. As soon as he was old enough, he had to work with his father and

mother in the fields. But the noon rest-hour gave him a little time in which to draw pictures, and at night he read and studied. At 18, when his brothers were old enough to take his place in the fields, the family savings were put together and he was sent to the near-by city of Cherbourg to study art.

It was the beginning of a new life for the country boy—a life which had all the somber tones of Millet's own paintings, as well as their simple quiet dignity. For with all the poverty and sickness that shadowed it, home love, high ambition, and resolute cheerfulness saved it from tragedy.

Later he went to Paris to continue his studies, but the time soon came when the masters of the day could teach Millet little more. He found himself out of sympathy with their conventional and arti-

ficial spirit. Nearly 20 years went by before he discovered his life-work, and began to paint the fields and the simple peasant-folk he knew and loved so well. Portraits, sold for a few francs, copies of the old masters, and even sign-painting provided him with a meager living in Paris and Cherbourg.

#### His Life and Art Close to the Soil

Then in 1848 he went to the little village of Barbizon on the borders of the forest of Fontainebleau, near Paris. Here he lived the life of the peasants, and put on canvas such stories of that life as are told in 'The Man with the Hoe', 'The Water Carrier', 'The Sower', 'The Gleaners', and 'The Angelus'.

Millet painted in the brown-gray earth tones of the fields; his great shadowy Sower seems part of the very soil he plants. He did not idealize rural life as other artists had. He pictured it with the sternness, and yet with the glory which he had found in it.

"Some tell me," he said, "that I deny the charm of the country. I find more than charm. I find infinite glories. I see the halo of the dandelions, and of the sun also, but I see as well the steaming horses at work in the plain, and a man who tries to straighten himself a moment to breathe." Artists and students understood Millet and his pictures, and many of the greatest of that day went to Barbizon to work with him. Thus arose the famous group of painters known as the Barbizon school. But public recognition did not come

MILLET'S PORTRAIT OF HIMSELF



Millet was born of peasant stock, and when he painted this portrait he recorded faithfully what his mirror showed him—a peasant with an artist's soul.

until the last ten years of his life. Just when life seemed brightening for him, his health failed, and he died.

Millet's pictures are now highly prized. Many are in the United States. The Chicago Art Institute has the 'Woman Feeding Chickens'; the Boston Art Museum has 'Harvesters Resting'; 'The Sower' and 'The Water Carrier' are in the Metropolitan Museum, New York; 'The Man with the Hoe' is in the San Francisco Museum.

**MILLET.** One-third of the world, it is estimated, relies for its staple food on the seeds of the cultivated grasses called millets. Originally the name applied only to the true Egyptian millet (broomcorn millet), but today it covers a wide variety of grasses with seeds large enough to be ground into flour by peoples who lack the larger grain crops.

Millet flours are not so palatable as most other breadstuffs, but most of them are very nutritious and the plants can be grown in regions where other cereal crops will not flourish because of scanty rainfall or extremes of temperature. They are extensively cultivated in China, India, and Africa.

The seeds are ground up for meal, or parched, or even eaten raw. From the seeds also a great variety of native beers and other fermented drinks are made.

Few Americans know the taste of millet flour, for in the United States the millet grasses are usually grown only for hay, for silage, for poultry food and bird seed, or as a catch crop to be plowed under to enrich the soil. Millets are very prolific, and have been cultivated in the Old World since prehistoric times. Ordinary millet seeds are smaller and far more numerous than those of the more common cereals.

The millets cultivated in the United States may be divided into three groups: Italian or foxtail millet, grown on 90 per cent of the millet acreage, a fast-growing annual much used as a summer catch crop in dry regions because it needs little moisture; Japanese millet, a cultivated variety of the weedy annual barnyard grass; and proso or broomcorn millet, the common millet of Europe, which is grown in the Dakotas, Montana, and adjacent Canada for grain and hay, because it matures readily in the short, dry season of that region.

Scientific name of Italian millet, *Setaria italica*; of barnyard millet, *Echinochloa crusgalli*; of broomcorn millet, *Panicum miliaceum*; of pearl millet, *Pennisetum glaucum*. Certain sorghums, such as kafir and durra, are sometimes called Indian or African millet. (See Sorghum.)

## MILTON, the Great Puritan POET and REFORMER

### *The Life and Work of the Many-Sided Genius Who Wrote 'Paradise Lost'*

#### CHIEF EVENTS IN MILTON'S LIFE

- 1608. Born, December 9, in Bread Street, London
- 1620. Enters St. Paul's School
- 1625. Matriculates at Cambridge University
- 1632. Takes his master's degree and retires to Horton
- 1638-39. Travels in Europe
- 1640-47. Teaching and writing pamphlets in London
- 1645. Publishes volume of collected poems
- 1649-60. Latin secretary to the Commonwealth
- 1652. Becomes blind; left a widower with three daughters
- 1660. Forced into temporary hiding to escape arrest
- 1667. 'Paradise Lost' published
- 1671. 'Paradise Regained' and 'Samson Agonistes' published
- 1674. Dies, November 8, in Bunhill Fields, London



The Poet at the age of 10



The Poet at the age of 62

**MILTON, JOHN** (1608-1674). From the cradle, John Milton was dedicated by his parents to lofty things; he was brought up deliberately to be a genius. In his early manhood he wrote to Charles Diodati, his first and only bosom friend: "Do you ask what I am meditating? By the help of Heaven, an immortality of fame."

This goal that he so clearly set for himself in the brilliant prospect of his early years, he achieved only at the bitter end of his days. Then he was blind, and neglected by his three stupid daughters. All his worldly hopes he had seen go down in defeat. His blend of intellectual pride and passion for liberty, which to us is sublime, was infuriating to his contemporaries. His own brother wanted him to change his name, so that the family might be spared the disgrace of being associated with "a traducer of the State, an enemy of the King, and a falsifier of Truth."

Milton was born Dec. 9, 1608, eight years before the death of Shakespeare. To quote his own words: "I was born in London, of a good family, my father a very honorable man." His father, also named John Milton, son of a staunch Roman Catholic, had turned Protestant while at Oxford, and was disinherited. He was a cultivated gentleman, a distinguished musician, and a well-to-do "scrivener" (a sort of attorney and financial agent). Of his six children, three died in infancy. Anne, John, and Christopher, in order of age, were the three who survived. Like his father, Milton came to be an accomplished musician; he is said to have had "a delicate tunable voice, and great skill." By his ninth year he was writing verse, and under private tutors perfecting his Latin and Greek. At 12, he was entered at St. Paul's as a day scholar. After that age, he tells us, he scarcely ever quit his lessons before midnight. The brilliant boy was trained to

the limit of his capacities and beyond the limits of his health and eyesight. By the time he left school for Cambridge in his 16th year, he was launched in French, Italian, and Hebrew, as well as Greek and Latin. The pride and hope of his family, who accepted his extraordinary native gifts as a simple and natural thing, he was early dedicated and set apart for scholarship and the church.

#### "The Lady of Christ's"

Milton was at Cambridge from his 17th to his 24th years. He took his A.B. degree in 1629, his A.M. in 1632. He was a strikingly handsome young man, far advanced in his studies beyond his fellow students. His early biographers agree that he "was a very hard scholar at the University, and performed all his exercises there with very good applause." He was argumentative and quietly assured of his own exceptional gifts. A contemporary said of him "that he was esteemed to be a virtuous and sober person, yet not to be ignorant of his own parts." The curriculum seemed to him antiquated and the tutors mostly bores. The levity of the ignorant young men who surrounded him he frankly despised. It is hardly surprising that he was not universally loved. That he was called "the lady of Christ's" (he was a member of Christ College, Cambridge) was at once a tribute to his good looks and a sarcasm upon the austerity of his life. Milton later observed that he had lived "aloof from vice, and approved by all the good." Though he gave up his intention of entering the Church, when he took his A.B. degree he subscribed "willingly and *ex animo*" to the Book of Common Prayer, the lawfulness of the episcopacy, and the supremacy of the king—all three of which in later years he was to recant.

#### Six Years of Happiness at Horton

Milton left the university in July 1632, with a sense of relief. His father, who was almost 70, had taken a place at Horton, a village near Windsor. Here Milton settled to the arduous task of preparing himself for immortality through "things unattempted yet in prose or rhyme." Of the six years at Horton, he left this summary: "On my father's estate I enjoyed an interval of uninterrupted leisure, which I devoted to the perusal of Greek and Latin authors; though I occasionally visited London, to buy books, or to learn something new in mathematics or music."

During his first year at Horton, in 1632, Milton made his first appearance in public print, in nothing less than the second folio edition of Shakespeare. His eulogy of Shakespeare, written in 1630, was one of the three anonymous pieces to preface that volume. It was at Horton, too, that in trial flight, as he called it, he wrote 'L'Allegro', 'Il Penseroso', 'Comus', 'Lycidas', and some of his sonnets. Though he pub-

lished his Horton poems in 1645, he never rated them other than preliminary exercises. Yet these minor poems rank high in English poetry, and some critics would less willingly lose 'Comus' and 'Lycidas' than the vaster productions of Milton's later years.

In 1637 his mother died. As he neared his 30th year,

#### WHERE MILTON FINISHED 'PARADISE LOST'



This is the famous cottage at Chalfont St. Giles where Milton was living when his great masterpiece was completed. He had been driven away from London by the Great Plague in 1665 and remained here nearly two years.

with such stupendous hopes and with so little yet accomplished, alone at Horton with his aged father, solitude and obscurity began to irk him, and he set out on a continental tour. From Paris, where the English ambassador entertained him, he moved on to two months in Florence, where "I found and visited the famous Galileo, grown old, a prisoner of the Inquisition." After two months in Rome, he moved on to Naples where he was checked by news that civil war was brewing in England and gave up his plans to visit Sicily and Greece. "I thought it disgraceful, while my fellow citizens fought for liberty at home, to be travelling for pleasure abroad." But he took his time in returning home, spending six more months in Italy, and tarrying awhile in Geneva.

#### Schoolmaster and Pamphleteer

Milton had been away 15 months. He found that in those troubled times the household at Horton had been broken up, and the family fortunes sadly depleted. "I hired for myself and my books a large house in the city [London], where I happily resumed my interrupted studies." There, about to embark on "the troubled sea of noises and hoarse dispute" as a writer of pamphlets, he undertook the education of the two sons of his sister, Mrs. Phillips. Later he took other pupils as well. Doctor Johnson, in his essay on Milton, looks "with some degree of merriment on the man who hastens home because his countrymen are contending for their



liberty" to "vapor away his patriotism in a private boarding-school." The charge is false. The Long Parliament was called in 1640. In 1641 Milton launched the first of his pamphlets—the gun that opened his 20 years of political warfare, attacking the corruptions of state and church and upholding the ideals of the Puritan party.

#### "Into a Snare of Misery"

In the spring of 1642 (probably not 1643, as we believed until recently) Milton visited a royalist family

#### THE BLIND POET DICTATING TO HIS DAUGHTERS



This well-known picture was painted by the eminent English artist, George Romney, in 1793, more than a century after Milton's death.

that lived near Oxford. He returned a married man—a 33-year-old husband with a pretty 17-year-old bride, Mary Powell. It was an unhappy marriage. Mary, says an early biographer, "found it very Solitary; no company came to her." After about a month she went back to her family, promising to return soon. She was away three years.

This marriage brought Milton the first great shock of his life. He saw one of his noblest ideals shattered, and through his fault, as he thought: he had allowed passion to overmaster him. Under the spur of his unhappy situation, he wrote a pamphlet on 'The Doctrine and Discipline of Divorce', advocating freedom of divorce. In passionate language, often of haunting beauty, he set forth ideals of marriage that even today sound rather "advanced." The pamphlet was greeted by a storm of insult, and by an attempt to prosecute him for unlicensed printing. In reply he wrote the masterfully eloquent 'Areopagitica', the most masterly defense of freedom of the press ever written.

#### His Service to the Commonwealth

From 1645 to 1649, Milton rested his pen and remained a silent witness to the civil war. But a few days before the execution of Charles I, Milton's voice again arose—it was the first to rise—upholding the right of the people to execute a guilty sovereign. With astounding courage (or the audacity of desperation), he published the 'Tenure of Kings and Magistrates' in January 1649. In March of the same year he was appointed secretary for foreign tongues under Cromwell.

His duties were to conduct correspondence with foreign states and to write pamphlets setting forth the views of the government. Cromwell and the Commonwealth were backed by their powerful army, but not by popular support. Against them was pitted the whole of European opinion. Milton's task was to educate the ignorant majority at home and to controvert all attacks from abroad. To that task he deliberately sacrificed his eyesight. Physicians warned him that he must stop work or lose his sight. His reply was that,

as he had already sacrificed his poetry, so he was now ready to sacrifice his eyes on the altar of English liberty. Complete blindness came in 1652. Worse even than blindness was the shattering of all his ideals and hopes with the downfall of the Commonwealth. After Cromwell's death, monarchy was restored, as Milton saw it, by the "epidemic madness and general defection of a misguided and abused multitude." With the landing of Charles II in 1660, the cause was lost. Milton was forced to go into hiding in a friend's house to escape the vengeance of the Royalists. The House of Commons ordered that he be arrested and that all copies of his pamphlets defending the execution of Charles I should be burned by the hangman. Through the good offices of powerful friends at court he escaped prosecution, but he was actually taken into custody by an officer of the House and released only after the payment of large fees.

#### The Last Fifteen Years

Now, in his 51st year, blind, embittered, and cramped by the loss of a considerable part of his fortune, Milton was free to resume the poetic task which he had given up 20 years before. His household consisted of three daughters, borne to him by his first wife, who had returned to him in 1645 and had died seven years later. His second wife, Katharine Woodcock, whom he had married in 1656, had died within a few months. His motherless daughters, we are told, gave him much trouble, rebelling against the drudgery of reading to him and writing at his dictation. Finally in 1663 he won domestic peace by taking a third wife, Elizabeth Minshull, a woman 30 years his junior.

With dauntless courage, Milton set about the task which he long had meditated. Nothing in literature is more magnificent than the picture of the blind Puritan dictating day after day the superbly rolling periods of his great epic, 'Paradise Lost'. In 1667, seven years after the Restoration, the task was completed and the world received the book which has had an influence on English thought and language surpassed only by the influence of the Bible and the plays of Shakespeare. The remaining seven years Milton devoted to his second epic, 'Paradise Regained', and to his powerful tragedy, 'Samson Agonistes'.

Contemporaries have left vivid descriptions of Milton's life in these later and calmer years. He would rise at four or five in the morning, listen while a chapter from the Hebrew Bible was read, then breakfast

and work until noon. After an hour spent in walking and another hour in playing on the organ or the viol, he would continue work till nightfall. Then he would have a supper of "olives or some light thing," a pipe, and a glass of water. Visitors would often come in the evening. He died peacefully Nov. 8, 1674, and was buried beside his father in the Church of St. Giles.

#### Milton's Works and Books About Him

Milton's chief poetical works, with the dates of publication, are: 'Comus' (1637); 'Lycidas' (1638); 'L'Allegro' and 'Il Penseroso' (1645); 'Paradise Lost' (1667); 'Paradise Regained' and 'Samson Agonistes' (1671); 'Sonnets' (published at various times). His best-known pamphlets are: 'Of Reformation Touching Church Discipline' (1641); 'The Doctrine and Discipline of Divorce' (1643); 'Of Education' (1644); 'Areopagitica, a Speech of Mr. John Milton for the Liberty of Unlicensed Printing' (1644); 'Tenure of Kings and Magistrates' (1649); 'Eikonoklastes' (1649); 'Pro Populo Anglicano' (1651).

Books about Milton are numerous. Especially useful are the single-volume lives by Richard Garnett, in the 'Great Writers' series, and by Mark Pattison, in the 'English Men of Letters' series. Other interesting short accounts are by Rose Macaulay, Walter Raleigh, and E. M. W. Tillyard. There are valuable essays by Augustine Birrell, S. T. Coleridge, Edward Dowden, Samuel Johnson, and Lord Macaulay. Robert Bridges' essay on 'Milton's Prosody', Denis Saurat's 'Milton: Man and Thinker', and M. A. Larson's 'The Modernity of Milton' are also recommended. For advanced study the 7-volume 'Life of John Milton' by David Masson is indispensable.

#### SATAN PLOTTING MAN'S DOWNFALL



This illustration for 'Paradise Lost' was made by Doré, the great French artist. It shows Satan and Beëlzebub immersed in a lake of fire, into which they have been cast after their fall from Heaven. "Upright he rears his mighty stature" the poem says of Satan, and the two fallen but still rebellious angels busy themselves plotting how they can offend God most grievously.

### 'Paradise Lost' and 'Samson Agonistes'

IF GOD is all-powerful and all-good, how is human suffering to be explained? Milton's triumphant answer is in 'Paradise Lost', where his boldly announced purpose is "to justify the ways of God to man."

No poem is more magnificent in scale and sublime in execution. The stage is Heaven, Hell, the Earthly Paradise, and all the starry universe. The action antedates time and includes all history from the moment of creation. The theme is the biblical story—

Of Man's first disobedience, and the fruit  
Of that forbidden tree whose mortal taste  
Brought death into the World, and all our woe,  
With loss of Eden . . . .

Following the example of the great classical epics,

Milton's epic begins abruptly. Thunderstruck and confounded, Satan and his rebellious angels lie submerged in a great lake of flames, having just been hurled headlong from Heaven. Satan rears himself, and on great wings flies above the burning abyss. He alights on the border of the lake and summons his legions, who build the great palace of Pandemonium. Untamed, Satan is ready for a second war on Heaven. He recalls an ancient prophecy of the creation of a new world, and a new race called Man.

The conclave in Hell plans to circumvent the Almighty by seducing this new race. Satan himself is commissioned to find the new world, and out of the gates of Hell—gates guarded by the monsters Sin and

Death—he plunges through Chaos and Ancient Night. Taking the form of a young angel, he alights on the Sun. Here his appearance deceives the Archangel Uriel who points him to the Earth—a globe suspended by a golden chain from Heaven.

Satan makes his way into Eden and spying about in the forms of bird and beast overhears from Adam and Eve the prohibition against the Fruit of the Tree of the Knowledge of Good and Evil. At nightfall, the guardian angel Gabriel sends two angels to survey Eden. They find Satan, in the form of a toad, whispering dreams into the ear of Eve—dreams of the magical power of the Forbidden Fruit to change her into a goddess.

Raphael is sent by God to warn Adam of the impending doom, and recounts, in the fifth, sixth, and seventh books of the poem, the story of the rebellion in Heaven, of the defeat of Satan, and of Creation. Milton puts into the mouth of the Archangel poetry of unsurpassed magnificence. In the eighth book, Adam, desirous of detaining Raphael, tells of his first awakening after his own creation, his conversation with God, his loneliness, and of the creation of Eve and their nuptials.

Adam and Eve, in their state of Edenic bliss, could have no future but a monotony of endless perfection. It was Eve who changed all that. After her dream, she awakens disquieted. She wants a little time to herself, away from Adam's superiority. She wanders off into the Garden, where Satan is in wait for her, gleefully thankful that she is alone. Satan has taken the form of a regally gorgeous serpent. He quiets Eve's surprise that he can speak by explaining that he has gained the gift of tongues by eating of the Forbidden Fruit. It has brought him not death, but wonderful new powers. And were Eve to eat the apple, she, too, would gain knowledge—knowledge of something that even Adam did not know. Eve eats, only to realize in a terrible afterthought that she has gained a superiority over Adam at the cost of taking on mortality:

Then I shall be no more;  
And Adam, wedded to another Eve,  
Shall live with her enjoying, I extinct!  
A death to think!

Rather than that, Adam, too, must eat, and companion her in the grave. Out of love for "this novelty on earth, this fair defect of Nature," Adam does eat, and then, in shame and loathing, recriminates Eve. (And the reader's heart is softened just a little, it may be, towards Mary Powell, the 17-year-old bride of Milton's 33d year. Milton never for a moment believed in the equality of the sexes. "Who can be ignorant," he asked in his first pamphlet on divorce, "that woman was created for man, and not man for woman?" He believed with Sir Thomas Browne that woman is but "the thirteenth part and crooked rib of man.")

Satan hastens back to Pandemonium and boasts before his assembled hosts of his triumph over the Almighty. His speech is followed not by applause but by "a dismal universal hiss"—the hissing of the

serpents into which God had transformed the once angelic hosts. Satan discovers that he is himself a monstrous crawling snake.

Before the expulsion from the Garden, an angel sets before Adam and Eve, in a great vision, the panorama of history to be unfolded in the centuries ahead. And Adam, at the end (to the surprise of many readers)—

Replete with joy and wonder, thus replied:

... Full of doubt, I stand,

Whether I should repent me now of sin

By me done and occasioned, or rejoice

Much more that much more good thereof shall spring.

The Fall, Adam seems to have come to believe, opened up for mankind a career. In a passage of haunting beauty the poem closes:

Some natural tears they dropped, but wiped them soon;

The world was all before them, where to choose

Their place of rest, and Providence their guide.

They hand in hand with wandering steps and slow,

Through Eden took their solitary way.

#### 'Samson Agonistes'

In his last work, 'Samson Agonistes', a poetic drama written according to the strictest conventions of classical Greek tragedy, Milton soared again. This drama is a pure jewel, nearly as splendid and much more human than 'Paradise Lost'. Denis Saurat has justly said: "Did not the majestic proportions of the epic forbid all comparison, one might be tempted, sacrilegiously, to give 'Samson' the first rank among Milton's works." Milton used the biblical story of the blind Samson among the Philistines to give the last and best expression of the history and the moral of his own life. The final mood is tragic serenity:

Nothing is here for tears, nothing to wail  
Or knock the breast; no weakness, no contempt,  
Dispraise, or blame; nothing but well and fair,  
And what may quiet us in a death so noble.

**MILWAUKEE, Wis.** The largest city in Wisconsin, Milwaukee lies on the west shore of Lake Michigan at the mouth of three converging rivers—the Milwaukee, the Menomonee, and the Kinnickinnic. It is one of the busiest lake ports, with an excellent harbor protected by four miles of government breakwaters in the beautiful Milwaukee Bay.

The most important item in its lake trade is coal, which is brought in vast quantities to turn the wheels of its varied industries. It is also the chief shipping point for the state's dairy products and grain. The leading industry is the manufacture of heavy machinery, such as steam shovels, dredges, excavators, cranes and hoists, turbines, agricultural implements, and mining, refrigerating, and milling equipment. Also important are automobile frames, electrical apparatus, leather and shoes, silk hose and other knit goods, motorcycles, soaps, gloves, trunks, candy, beer, and many other products. The name "Cream City" comes from a cream-colored brick made there.

The city has more than 200 churches, representing a score of faiths. It is the seat of a Roman Catholic archbishop and of a Protestant Episcopal bishop. Besides a well-organized public school system, it has many private educational institutions, including



Marquette University, conducted by the Jesuits; Concordia College, a Lutheran organization; the Convent of Notre Dame; Milwaukee-Downer College; a state teachers college; and an extension branch of the University of Wisconsin. In addition to an attractive boulevard system, there are about a thousand acres of public parks. Zoning laws keep the manufacturing districts from the residence sections, and more than half the inhabitants own their homes.

The site of Milwaukee was first visited in 1679 by members of La Salle's expedition, who noted that an Indian village was situated on the "Melleoki" River. The first permanent settlement was made in 1818, when Solomon Juneau settled on the east side of the stream. Twenty-seven years later the city was incorporated and Juneau was chosen first mayor. German immigrants had begun to arrive in 1838, and the number increased rapidly until the city became one of the chief German centers in America. In later years immigrants of other nationalities have settled in great numbers—chiefly Poles, Russians, Yugoslavs, Austrians, Italians, and Czechoslovaks. Milwaukee is one of the strongest Socialist centers in the United States and has had several Socialist administrations. The city's mayor and board of aldermen are elected every two years. Population (1940 census), 587,472.

## SUBSTANCES in the THIRD Great "KINGDOM"

**MINERALS.** "Animal, vegetable, or mineral?" we used to ask in the old guessing game, assuming that what did not fit into the first two "kingdoms" was bound to belong in the third. For general purposes this is true, but the scientist draws a closer distinction. To be classified by him as a *mineral species*, a substance must exist in a natural state and have a definite chemical composition. Glass, for example, being made by man from widely varying mixtures and compounds, has no standing in the field of *mineralogy*. A few minerals, including certain types of limestone and iron ore, are believed to have been produced by living plants and animals, but virtually all true minerals (which, as we shall see, do not include coal, petroleum, and the like) are of non-living origin.

The rocks of the earth's crust consist of minerals, often of many kinds mixed together; so do the vein deposits which provide most of our useful ores. Other minerals may be deposited by the waters of lakes or hot springs or be formed in active volcanoes. Minerals constitute the chief raw materials of chemistry and of many great arts and industries. Indeed, the search for and the gathering of useful minerals, as well as of those which are beautiful and rare enough to be classed as gems, provide one of the most important and romantic chapters in the history of our civilization. (See Chemistry; Civilization; Gems and Jewelry; Mines and Mining.)

No one knows exactly how many mineral species exist. Mineralogists differ among themselves in the distinctions they draw between many of the known

**MIND.** Whatever men mean by the word "I," when they say, "I know or believe, I suffer or rejoice," this, says a great psychologist, is the mind of man—it is that which thinks, remembers, reasons, feels, or wills. The dictionaries tell us that mind is "conscious intelligence" or the "faculty of knowing." The brain is the main seat of the mind, yet mind can scarcely be said to be absent from any tissue in which feeling resides, and some, with Herbert Spencer, would even assume the existence of a "mind dust" diffused with matter throughout the universe. Certainly an interrelationship exists between the physical body and the mind, and this is so nicely balanced that for either to be well and normal, the other must be well also. Thus the old Greeks were not wrong when they set up as their ideal "a sound mind in a sound body."

Psychology is the science which deals chiefly with the mind. However, the modern tendency is to emphasize behavior, or what the individual does, rather than the conscious states.

There are differences of opinion as to how far down the animal scale what is usually called mind can be traced. Some writers hold it is characteristic only of human beings, others see in the human being only a more complex manifestation of what is present in all animals. (See Animal Kingdom; Brain; Psychology.)

species. Probably about 1,500 have been recognized by science, and less than 150 are important industrially or scientifically. The ending *ite* is characteristic of most mineral names. To the beginner these names often seem strange and difficult because they contain a kind of shorthand description or history of the mineral in question. Many are named after the men who discovered them, or in honor of distinguished scientists; others get their names from the place where they are found, or from some outstanding characteristic, such as color, heaviness, or their chief chemical ingredients.

Mineralogists identify minerals chiefly by *color*, *hardness*, *cleavage*, *crystal form*, and sometimes by simple chemical tests. Related to the color of a mineral are *transparency* and *luster*. The *streak* is the color produced when a piece of the mineral is drawn over the surface of rough, unglazed porcelain. It is often different from the surface color of the specimen.

The hardness of minerals usually is stated by comparison with the following typical minerals arranged to form a standard scale from the softest to the hardest.

- |             |             |
|-------------|-------------|
| 1. Talc     | 6. Feldspar |
| 2. Gypsum   | 7. Quartz   |
| 3. Calcite  | 8. Topaz    |
| 4. Fluorite | 9. Corundum |
| 5. Apatite  | 10. Diamond |

If a mineral has, for example, a hardness of 6.5 this means that it will scratch feldspar, but will be scratched by quartz.

The cleavage of minerals is the way they split or break, as mica, for example, which splits into thin flat

sheets. This and many other properties of minerals are controlled by their crystal form (see Crystals). Six crystal systems are commonly recognized by mineralogists, distinguished by the length and direction of the three or more axes which may be thought of as existing inside any crystal. These systems are:

(1) *Isometric*: three axes of equal length and at right angles to one another. A typical form is the cube.

(2) *Tetragonal*: two of the right-angle axes are equal in length, while the third one is longer or shorter. A typical form is a square prism like a section of a square column.

(3) *Hexagonal*: three axes of equal length, in the same plane and equally spaced around the center, with a fourth axis at right angles to the plane of the three. A typical form is a six-sided prism. The so-called rhombohedral system is a part of the hexagonal system as thus defined.

(4) *Orthorhombic*: three axes at right angles to each other, all of different lengths. A typical form is a prism of three unequal dimensions, like a brick.

(5) *Monoclinic*: two axes unequal in length at right angles to each other, with a third axis still different in length inclined to the plane of the other two. A typical form is a prism with its top and base inclined to its sides, like a brick distorted sidewise.

(6) *Triclinic*: all three axes unequal in length and inclined to each other. A typical form would be a brick distorted both sidewise and endwise.

It must be understood, of course, that the experienced mineralogist rarely needs elaborate tests and methods of identification to distinguish mineral specimens; he learns to recognize most of them at sight, just as a botanist recognizes different plants or as a man recognizes his friends.

A few chemical elements are found free in nature, and are then called *native*. Gold, platinum, and copper are the chief native metals, although most of the world's copper is obtained from mineral compounds. Native iron occurs in meteorites. Mercury, lead, and silver are also encountered in uncombined form. The commonest non-metallic native element is sulphur. Carbon exists native in two forms, diamond and graphite.

#### Important Minerals and Their Value

The following paragraphs describe the important minerals from the point of view of interest and industrial value. The names mentioned are those most likely to be met in general reading.

Among the leaders are the sulphide minerals, many of which are used as ores. Lead sulphide forms the mineral *galena*, silver sulphide forms *argentite*, and zinc sulphide forms *sphalerite*. The three often are found mixed together. Two important sulphides of arsenic are *realgar* and *orpiment*. Antimony sulphide is *stibnite*, used both as an ore of antimony and in powdered form for safety matches and cartridge primers. The noted mineral called *cinnabar* is a sulphide of mercury. The sulphide of molybdenum, called *molybdenite*, is the chief ore of that metal.

There are three very important iron sulphides, called *pyrites*, *marcasite*, and *pyrrhotite*, all differing slightly in chemical composition. Pyrites is also known as fool's gold, being a yellow mineral with a brilliant luster, somewhat resembling to inexperienced eyes flakes of native gold in a rock. Two copper sulphides

exist as minerals, called *chalcocite* and *covellite*. Many important ore bodies consist of mixtures of the copper and iron sulphides, notably *bornite* and *chalcopyrite*.

A second great mineral group consists of carbonates, including the plentiful mineral *calcite*, which is calcium carbonate. Large transparent crystals of calcite are called *Iceland spar*. *Satin spar* is a somewhat less pure, translucent variety. Ordinary *limestone* consists largely of calcite. *Marble* is calcite in crystallized form and capable of taking a polish, the various colors of ornamental marbles being caused by chemical impurities or by veins of other minerals. The *stalagmites* and *stalactites* found in caves usually consist of calcite. *Marl* is an impure limestone, imperfectly hardened. *Chalk* also contains calcite, often in the form of microscopic shells of sea animals. *Aragonite* has the same chemical composition as calcite, but a different crystal form.

Another well-known mineral in this group is magnesium carbonate, called *magnesite*. This frequently occurs mixed with calcite, forming *dolomite*, or dolomitic limestone. Two copper ores of some importance are the copper carbonates, *malachite* and *azurite*, either of which may exist in beautiful green or blue crystals sometimes used as ornamental stones. Iron carbonate exists as the mineral *siderite*, once much used as an ore of iron. Manganese carbonate, called *rhodochrosite*, is an occasional ore of that metal.

#### The Group of Oxides

The chemical group of oxides includes the commonest and most widespread mineral of all, silicon oxide or *quartz*, also called *silica*. Quartz is found in a great variety of forms including many semi-precious stones (see Quartz; Silicon). *Sinter* is an impure quartz deposited by hot springs. *Silex* is a name sometimes given to powdered quartz, either natural or artificial, often used in polishing. *Diatomaceous earth* or *kieselguhr*, also called tripolite or tripoli powder, is a powdered quartz containing myriads of siliceous cell walls of the microscopic water-plants called diatoms. Two minerals consist of the chemical elements of quartz combined with water. One of these is called *tridymite*. The other is *opal*, including the fire opal and other gems of the group.

Among the important metallic oxides which exist as minerals are *cuprite* or copper oxide, *zincite* or zinc oxide, *cassiterite* or tin oxide, *rutile* or titanium oxide, and *pyrolusite* or manganese oxide, the last being the chief ore of manganese. The chief ores of iron are also oxides called *hematite* and *limonite*, the latter containing chemically combined water. *Magnetite*, of which lodestone is the magnetized variety, is another iron oxide. *Ilmenite* is a mixed oxide of iron and titanium existing in large deposits, but not yet workable as a source of iron because of the cost of removing the titanium.

Aluminum oxide, known in mineralogy as *corundum*, exists in two transparent and beautifully colored forms, *sapphires* and *rubies*. In both instances the color is due to traces of impurities. Impure corundum

forms the *emery* used in powdered form for grinding and polishing. *Bauxite*, the principal ore of aluminum, is an oxide chemically combined with water; *spinel* is a mixed oxide of magnesium and aluminum; and *chromite* is an iron and chromium oxide constituting the chief ore of chromium.

The chief phosphate mineral is *apatite*, which is phosphate of calcium containing a little fluorine. An impure form of it is the *phosphate rock* used for the manufacture of fertilizers. A complicated phosphate mineral of some practical importance is *monazite*, usually found in sea-beach sand and the chief source of the rare metal cerium, used for gas mantles and for the fire-making alloy employed in cigarette lighters. The metal tungsten, now important for the manufacture of electric lamps, comes chiefly from two minerals, *scheelite*, which is calcium tungstate, and *wolframite*, which is a mixed tungstate of the elements manganese and iron.

The leading radioactive minerals, used as sources of radium, uranium, thorium, and similar elements, are *uraninite*, *carnotite*, *broggerite*, and *clevite*. All are complex oxides of the radioactive and other elements, usually containing lead. (See Radium and Radioactivity.) *Pitchblende*, in which mineral radioactivity was first discovered, is an impure, poorly crystallized uraninite.

A relatively few minerals, some of which are of considerable practical importance, are soluble in water and form the group of *salines*. Most prominent of these, of course, is sodium chloride, or common salt, known in its mineral form as *halite*. Potassium chloride, called *sylvite*, is one of the important minerals in the famous Stassfurt mines in Germany, still the world's chief source of potash. Other important Stassfurt minerals are *carnallite*, which is a mixed chloride of calcium and magnesium; *polyhalite*, which is a calcium and magnesium chloride and sulphate; and *kainite*, similar in composition to polyhalite. At Searles Lake in California, now the chief American source of potash and borax, there is a large, porous body of halite and another saline mineral called *trona*, a complex carbonate of sodium. In the interstices of this saline mass exist millions of tons of a brine containing potash and borax. Other sources of borax are *colemanite* and *rasorite*, both of which are complex borates of lime.

Another water-soluble carbonate of sodium existing occasionally in desert regions as a mineral is *natron*,

of the same chemical composition as crystal washing soda. Sodium sulphate, known chemically as Glauber's salt, exists as the mineral *mirabilite*. Epsom salt, chemically magnesium sulphate, exists as the mineral *epsomite*. Potassium and sodium nitrate exist as minerals respectively known as *niter* and *soda niter*. The latter is the most valuable ingredient in the *caliche* from which commercial nitrates are produced in Chile. (See Fertilizers.)

A chloride mineral related to the saline group but not so easily soluble in water is the copper chloride called *atacamite*, an important ore of copper in Chile. Sulphates, also insoluble but related chemically to the saline minerals, are *barite* or *barytes*, a barium

#### QUARRYING A COMMON MINERAL IN ENGLAND



Tons of chalk are used every year in England, for much the same purposes as limestone is used in the United States. The great chalk cliffs here at Mitcheldever, in Hampshire, furnish many carloads of building material. This chalk contains calcite, which is calcium carbonate, often in the form of microscopic shells of millions of marine animals.

compound; *celestite*, an important ore of strontium; *alunite*, an aluminum and potassium sulphate; and *gypsum*, a calcium sulphate containing water, which is the source of plaster of paris. Transparent crystals of gypsum, often in plates or in arrow-head form, are known as *selenite*. Calcium sulphate is found uncombined with water and is called *anhydrite*.

#### Two Important Fluorine Minerals

Two fluorine minerals are important: calcium fluoride or *fluorite*, also known as fluorspar; and *cryolite*, which is a double fluoride of aluminum and sodium. Fluorite is used as a flux in many metallurgical operations, and the rare clear crystals of this mineral are invaluable for making lenses to be used with ultraviolet rays.

The most numerous minerals, and the commonest except for quartz, belong to the group of silicates consisting of silicon and oxygen combined with potassium, sodium, magnesium, aluminum, iron, and many



other elements. A prominent group of silicates are the *feldspars*, including *orthoclase*, a potassium and aluminum silicate; *albite*, containing sodium instead of potassium; *oligoclase*, containing calcium in addition to sodium. A related silicate is *leucite*, containing potassium and aluminum and often suggested as a possible source of potash. Another prominent group of silicates contains the *micas*. The yellowish, transparent mica often used for stove windows is *muscovite*, consisting chiefly of silicates of potassium. A common black mica is *biotite*, containing magnesium and iron. *Lepidolite*, containing lithium, is one of the relatively few ores of that metal.

The mineral *pyroxene*, also called *diopside*, is an important rock-forming mineral together with the feldspars and micas. It is a complicated silicate of calcium and magnesium, sometimes containing aluminum or iron. One of its varieties is *spodumene*, sometimes found as a clear pink crystal and used as a gem under the name of *kunzite*. Another variety of pyroxene forms *jadeite*, which is the true Chinese jade.

#### Asbestos and Talc

Closely related to pyroxene is *amphibole*, an even more complicated silicate. A variety called *hornblende*, containing aluminum, sometimes occurs in long, fiber-like crystals forming one kind of *asbestos*. Another kind of asbestos is a fibrous variety of the mineral *serpentine*, which is a hydrous magnesium silicate. Similar to serpentine in composition is *talc*, the source of talcum powder. *Soapstone* and *steatite* are varieties of talc, usually impure. *Meerschaum*, used to make tobacco pipes, is another hydrous silicate of magnesium. Still another iron and magnesium silicate, also important in rock formation, is *olivine*.

A hydrous silicate, somewhat like talc but containing aluminum instead of magnesium, is the mineral *kaolin*. The majority of clays consist of impure kaolin. The *fuller's earth* used in cleaning cloth is also a variety of kaolin. *Greensand*, which covers large areas in New Jersey and has been suggested as a source of potash, is an impure claylike material containing grains of the mineral *glauconite*, an iron and potassium silicate.

#### Some Brilliant Gems

*Tourmaline*, a complicated iron, aluminum, and magnesium silicate containing some boron, frequently appears as a minor constituent of rocks. It is found also as large transparent crystals sometimes used as gems but even more valuable in physical laboratories for the study of polarized light (see Light). *Zircon*, a silicate and chief ore of zirconium, may form clear crystal gems called *hyacinths*. *Topaz* is an aluminum silicate containing some fluorine. *Beryl* is an aluminum and beryllium silicate forming the chief ore of beryllium. The *emerald* and *aquamarine* are crystal forms of beryl, the former containing traces of chromium. Two zinc silicates are of importance: *willemite*, used in physical experiments because X-rays render it fluorescent; and *calamine*, sometimes valuable as a zinc ore. Several hydrous silicates, chiefly of potassium

and calcium, called *zeolites*, have come into use recently for the softening of water. The most important one is *apophyllite*, but for commercial purposes zeolites are now usually made artificially.

We have seen that a few rocks, like limestone and quartzite, consist of single mineral species, but most of them contain several minerals mixed together. Nevertheless, many of these mixtures recur so uniformly that they have acquired distinctive names. Geologists divide rocks roughly into *sedimentary* rocks, formed from sand, clay, or other material deposited in water; *igneous* rocks, formed by volcanic or other intense heat; and *metamorphic* rocks, originally sedimentary but later modified by heat or other natural processes. (See Geology.)

#### Sedimentary and Igneous Rocks

The commonest sedimentary rocks are *sandstone* and *shale*. The former consists of visible sand grains, while the latter consists mostly of finer material frequently containing kaolin. *Argillite* is the fine-grained, stratified variety of shale which is used for roofing slates or natural writing slates. *Oil shale* contains more or less petroleum or asphalt derived from microscopic plants or animals buried with the shale when it was laid down. *Conglomerates* include the very coarse-grained sandstones often containing pebbles or even large boulders. *Alluvium* is the geologist's name for surface sedimentary deposits not yet hardened into rock. *Till* is a variety of claylike alluvium, often containing boulders and pebbles, believed to have been deposited by glaciers. *Loess* is a fine-grained material probably laid down as wind-blown dust during the Glacial Period.

One of the chief igneous rocks is the familiar *granite*, made up of crystals of quartz and feldspar, usually mixed with other minerals. *Gneiss* has the same mineralogical characteristics as granite, but shows traces of stratification, as though it had been formed by the partial melting of a sedimentary rock. Many geologists believe this to be a fact and imagine that many granites, also, are really metamorphic rocks that were formed deep in the earth's crust by the melting of rocks like sandstone or shale. *Schists* are still more clearly metamorphic, apparently formed by the partial recrystallization of shales under the action of heat or hot water. More certainly of true igneous nature are *trachite*, *syenite*, *diorite*, *dunite*, *dacite*, and *gabbro*, consisting of varied mixtures of quartz, feldspar, and other rock-forming minerals.

#### Rocks of Volcanic Origin

Any melted rock poured out by a volcano is called *lava*; there being two chief types, the blackish, heavy lava called *basalt*, and the lighter-weight *rhyolite*, usually of reddish color. *Pumice* is a porous, frothy lava produced when the melted rock contains gas bubbles so that it is raised on escaping from pressure, just as bread is raised by yeast. *Obsidian* is a glass-like rock produced when certain kinds of lava cool so rapidly that there is not time for the crystallization of individual minerals. Because it breaks with sharp

edges, obsidian was much used by primitive men for arrow-heads, knives, and other tools. *Volcanic ash*, also called *tufa* or *tuff*, consists of tiny fragments of glasslike obsidian or pumice blown out into the air in millions of tons during volcanic eruptions.

*Coal* and *oil* are not really mineral species, but the remains of plant and animal materials buried between layers of sedimentary rocks and slowly changed more or less completely by heat, pressure, and percolating water, very much as shales or sandstones may be converted into schists or other metamorphic rocks (see *Coal*). All grades of carbonaceous or oily shales and sandstones are due to the burial of mixed mineral and organic debris. The gem called *amber* also is of living origin, being the gum of ancient trees similarly buried and partly converted into harder material. Animal bones, tree trunks, and many other materials buried with sedimentary rocks may be *petrified* or *mineralized* with quartz, calcite, or other minerals, thus producing *fossils*. (See *Fossils*.)

#### Minerals Essential to Life

In recent years experts in diet have learned that several mineral elements are essential in human foods. Under normal conditions plant roots extract these from the soil and pass them along to us either directly, in our vegetables and fruits, or indirectly, through the flesh, milk, or eggs of plant-eating animals. By growing too many crops in a field or garden without restoring the requisite minerals to the soil, we may rob ourselves of some of the necessary ingredients of our diet.

Both sodium and chlorine in the form of common salt are essential to ordinary animal life. Calcium and phosphorus are required for the manufacture or repair of bones and for other purposes. Many foods, including

milk, contain them. Iron is necessary for the blood, and is supplied by red meat and by many vegetables, especially leafy ones like spinach. The small amounts of potassium and sulphur believed to be necessary for muscle fibers and other cells are also supplied by vegetables. The iodine required for the thyroid gland may be lacking in the natural drinking waters of certain regions, and may need to be secured from sea foods or from iodized salt. Some soils contain iodine and impart it to vegetables grown in them. The traces of fluorine, often found in vegetables and drinking water, help to harden the teeth, but too much of it discolors and impairs the enamel. Copper seems necessary to foster the production of hemoglobin in the blood. Like iron, it comes in red meat and fresh vegetables. Zinc has been proved essential to plant and animal growth. Magnesium is necessary for the formation of chlorophyll in plants, and animals deprived of it die in convulsions. The traces of manganese and boron found in both animals and plants appear to play an important part in their growth.

(See also the articles on the principal metals and other elements for further minerals used as ores, chemicals, pigments, etc.)

**MINERVA.** The Roman goddess of wisdom, science, and the arts, identified with the Greek Athena. Her oldest sanctuary at Rome was the temple built by Tarquin on the Capitol, where she was worshiped with Jupiter and Juno. Another of her temples, on the Aventine, was the meeting place for dramatic poets and actors, who were organized into guilds under her patronage in the 3d century B. C. All the school children had a holiday on the day of her festival, the 19th of March. (See *Athena*.)

## How MAN WINS TREASURE from the EARTH'S DEPTHS

### MINES AND MINING.

Mining is one of the great basic industries. The annual output of the mines and quarries of the United States, which produce about a third of the mining products of the world, usually ranges from \$6,000,000,000 to \$7,000,000,000 in value and makes up almost two-thirds of the country's freight traffic. To move an average year's output would require 500,000 freight trains of 40 cars each. Coupled together, these would be 151,000 miles long, and would wind six times around the earth. Three-fourths of all explosives used in the United States are used in the mining industry. The mines of the United States employ more than 1,000,000 men—about three-fourths of them being coal miners; the mines of the world employ 6,000,000 men. Millions more are employed in the allied industries, such as the manufacture of iron and steel, copperware, coke, chemicals,

*WHEN you look at a piece of coal or iron, or at gold and silver watches, rings, pins, diamonds, rubies, etc., in jewelry shop windows, you may recall that once, in their original crude states as minerals, metals, or gems, they were all snugly secreted by Nature in treasure chests in the earth, in some cases thousands of feet underground. But do you ever consider how the precious stores are got out of their hiding places and won for the use of mankind in making life effective, comfortable, secure, and beautiful? It is by the toilsome and fascinating processes described in this article.*

etc., which are directly based on the mining industry:

The story of mining is one of tragedy and romance. The mining field is the world's roulette table. In a day the man who thought himself wealthy may become a pauper, the pauper may

become a millionaire. A single stroke of pickax or spade has again and again uncovered a fortune. Yet for every fortune made in mining a hundred still remain. In modern times mining has lost much of its former element of chance, and now is organized and conducted much like other sorts of business, with perhaps a larger element of risk in the early stages.

Even the dangers of mining whet the imagination. Fire, water, poisonous gases, breaking ropes and ladders—no wonder the mountain miners of Germany peopled their mines with goblins and prayed to the saints before descending. The world little realizes

the magnitude of the debt it owes to the "toilers of the deepest deep."

Prospecting for gold is relatively simple. Gold is rarely dissolved by earth waters; so when deposits are washed away, pure gold accumulates with sand and gravel along the stream. The prospector fills a pan with the sand or gravel and water, and then rocks and whirls it to permit the heavier gold to sink to the bottom, gradually removing the lighter material at the top until a few nuggets, flecks, or fine particles of gold remain in the angle between the sides and bottom of the pan. When he finds gold-bearing gravels, the prospector follows them upstream, panning gravel as he goes, in order to locate the vein or "mother lode" from which the stream washed the gold.

Mines yielding metal-bearing sands and gravels are called placer mines. Tin, platinum, chromium, and a few other metals are found in placers, while lead, silver, copper, and zinc are mined almost entirely from veins or lodes that lie in solid rock. Many lodes crop out as ledges at the surface, and lead and silver veins are often rich in those metals at the very surface. Copper and zinc, on the other hand, are generally leached out of the surface ores by water that dissolves the metals and carries them away, so such deposits are generally found by digging down into a streak of rusty iron ore. Iron is nearly always present in copper and zinc lodes, and the iron is rarely all removed by earth waters. The zinc and copper ores appear in depth at places where they have not been dissolved and carried away.

#### Hunting for Oil

Prospecting for oil and gas presents some novel features. These fuels are found together with salt water in beds of sedimentary rock, where they have been formed from the decomposition of remains of plants and animals that were buried with the beds in the sea. When formed, the beds were nearly flat, but at many places the rocks are folded up so that they form *anticlines*, or up-folds, and *synclines*, or down-folds. The oil and gas rise to the top of the up-folds, collecting in domes or basins. In prospecting for oil the rocks that crop out are studied, particularly those that carry oil seep or asphalt, for natural asphalt is the dried residue of oil. (See Petroleum.)

If rocks at the surface dip away from an area in all directions, the oil-bearing rocks below are likely to dip in the same manner, indicating the presence of a dome or basin beneath the surface. Consequently, the geologist, prospecting for oil, searches for anticlines.

Geophysical prospecting depends upon some physical property of the hidden deposit, such as its magnetic properties, its gravity or mass, its electrical effects, or its effects upon earthquake waves formed by explosions. Certain ores of iron have strong magnetic attraction and can be discovered by the magnetic needle, which has but a limited use because so few ores are magnetic. Plumb bobs and pendulums are utilized in discovering heavy ore bodies, by taking advantage of the relatively greater gravitational pull of heavier

bodies (see Physics). By exploding charges of dynamite, buried in the earth about 6 feet, and recording the differences in the time of travel of the sound through the air and the shock through the ground by *seismometers* set up in suitable places, salt masses deep in the earth may be detected. Sound travels through air about 1,100 feet per second, and about 6,000 feet per second through rock near the surface, and still faster at greater depth. In some salt bodies the speed of the wave is said to reach 10,000 feet per second or more, and the quick arrival of the shock indicates the presence of buried masses of salt or other bodies. Since oil deposits in certain limited regions are commonly found lying against salt masses, it is possible to discover the oil by drilling places where the seismometers have indicated that salt is probably present.

Other methods of geophysical prospecting include the use of electric currents. Where sulphides are attacked by earth waters, feeble electric currents are generated. By measuring them and locating their sources such deposits may be found. By other methods, electric currents are generated and their behavior in the ground studied, and the locations of disturbing ore bodies or other deposits determined.

Thus other sciences have come to the aid of the geologist and the prospector in the task of discovering ores. Topographic maps are made by the photographer from airplanes, and to a certain extent the geology of certain areas has been mapped from airplanes. The magnetic needle, the pendulum and plumb bob, the earthquake recorder, the radio, and the electric current generators have all proved useful. Most of these devices, however, are limited in scope, for the effect of physical properties of deposits decreases rapidly with the distance; so little reliance can be placed on them where the ore bodies are more than a few hundred feet deep. As we learn more about these physical properties of deposits, and as we learn to record various effects more accurately, the use of such methods will probably increase and their records will become more reliable.

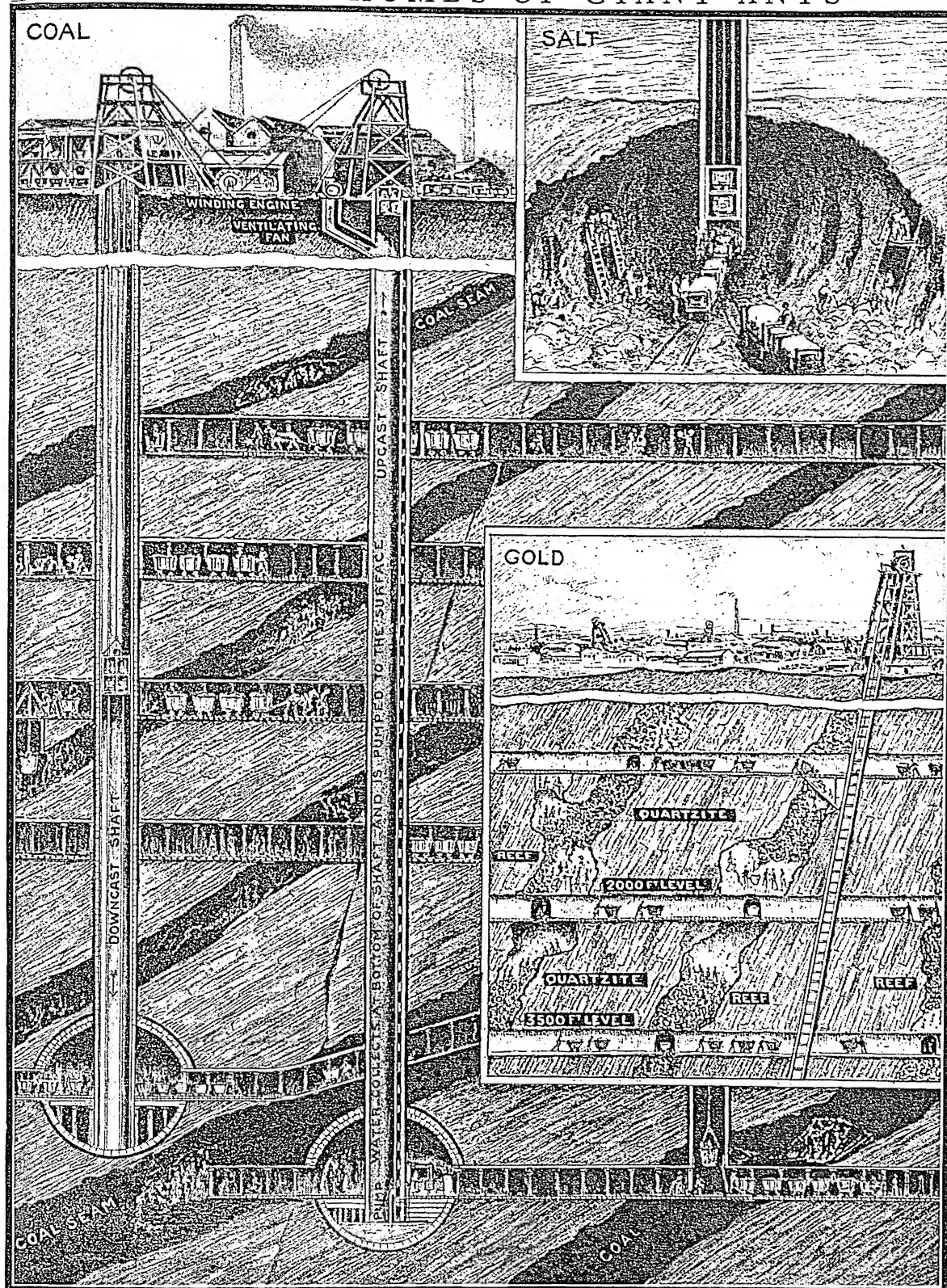
Suppose the prospector has finally determined that the desired mineral is present in a given region. To determine the extent of the deposit he may make further examination by stripping off the soil; or he may dig shallow pits, or trenches. Mining fields the world over are dotted with such excavations, each telling, in its abandonment, a story of hope and failure.

The more usual method of testing ground is by borings, made by means of a diamond drill, a long metal tube with black diamonds at the ends for cutters. When rotated at high speed, the tube extracts a core of rock. Holes have been thus drilled several thousand feet deep, in some cases at the rate of 60 feet a day. In hard rock, the rate is slower.

If these explorations indicate valuable ore, the prospector or the company stakes out a claim and begins to develop a mine. Mining methods vary according to whether the minerals are found (1) in alluvial deposits (gravel, sand, silt, etc.) on the sur-



# LIKE THE HOMES OF GIANT ANTS



These three pictures tell the story of how men work in getting coal, salt, and gold out of the earth. The general principle in all is much the same, the excavated material being brought to a shaft and hoisted to the surface. You can see also how the veins or seams of the minerals are followed by the miners in their underground burrowing.

face; (2) in layers or beds beneath the surface, like iron ore, coal, and salt; or (3) in veins or seams (often called "lodes"), some of which are merely fillings in old cracks or fissures in rocks.

Mining in alluvial deposits is called placer mining. Placer mining is carried on in various ways, but the essential thing is to cause water to flow over the sand and gravel, so as to wash away the lighter material and leave the heavy and useful mineral behind (*see Gold*). "Open-pit" mining is the term applied where ores are uncovered and scooped out with the aid of steam shovels. The latter method is widely used in the Minnesota iron mines, and in some of the copper mines of the southwest.

#### Making Shafts and Tunnels

For vein and bed deposits beneath the surface, tunnels or vertical or inclined shafts are dug from the surface to the substance to be mined. Tunnels are made especially where the ore body lies in the side of a mountain. Tunnels form the best method of mining, for conveying ore horizontally out of a tunnel is much cheaper than hoisting it up through a shaft, and by having the tunnel on a slight incline drainage or pumping expenses are curtailed. In the middle western United States, it is common to see the mouths of mines leading into the sides of hills, like dirty yawning caves, with some mine light glimmering faintly in the black interior.

When a shaft is sunk, tunnels called "drifts" and "crosscuts" are dug sidewise from it at different levels and in various directions into the mineral seam. Thus an elaborate mine is like an underground city, with an orderly arrangement of streets and alleys, though not all on one level. Some mountains, particularly in the western United States, are honey-combed with such underground workings. Where practicable these passageways are made to slope down a little toward the mouth of the tunnel or toward the central shaft so that the water may flow out of the tunnel, or water in the mine may drain into the sump or pool at the bottom of the main shaft, whence it is pumped out. The different levels of a mine are connected by auxiliary vertical shafts or "winzes." The ore between the various openings is said to be "blocked out." (*See Copper for description of shaft and equipment.*) Ventilation is accomplished in shallow mines by an air shaft. In deeper mines large rotary fans or blowers, driven by steam or electricity, are used to force fresh air into the far corners of the mines.

Mine buildings, constructed frequently of galvanized iron, with towering pipes and smokestacks, resemble great mills. A huge building is erected over the mine entrance in many cases. Often separate buildings are constructed for the mining machinery, engineers' offices, labor quarters, and explosives, etc.

Now let us visit a coal mine to see how it is worked, since coal mines have much in common with all underground mines. Unless the mine is lighted by electricity, the grimy miner wears attached to his

small cap a little safety lamp, his only light in a world of blackness (*see Davy, Sir Humphry*). He is carried down into the depths of the pit by an elevator-like hoist called a "cage," passing the various levels just as you pass busy floors in a factory elevator. Following the main tunnel at the level on which he is to work he passes through a branching gallery until he reaches the black shiny wall of coal called the "working face." Then, perhaps lying on his side, he begins to break down the coal. He uses a pick, a shovel, a steel rock-drill—driven by steam, electricity, compressed air, or even a hand hammer—and various pneumatic or electric cutting and digging machines, such as the "undercutter," which undermines a ledge of coal by means of an endless chain in which knives travel around in a frame. Such machines are often mounted on rails, being moved along from place to place as the cutting proceeds.

The drill is employed chiefly in blasting. The miner drills small "bore holes" in the coal and inserts charges of black powder, which are touched off with an electric current. A muffled roar, and the coal in the face of the mine crumbles, the coal falling down in great chunks. As the coal is removed the mine roof is supported by leaving pillars of coal at intervals, or by using timbers, for one of the greatest of mine terrors is the danger of having the roof cave in. Accidents in which hundreds have been entombed alive are numerous. Extreme precautions against such accidents are now taken in all intelligent mining.

#### How the Coal Reaches the Surface

The miner next sorts the coal and loads it on small trams or dump cars on tracks. The cars are hauled to the main shaft by compressed air or electric locomotives, or by mules and horses, the animals being quartered in subterranean stables and living their entire life in the mine, rarely or never seeing daylight. In China, Mexico, and South America ore is still carried on men's backs.

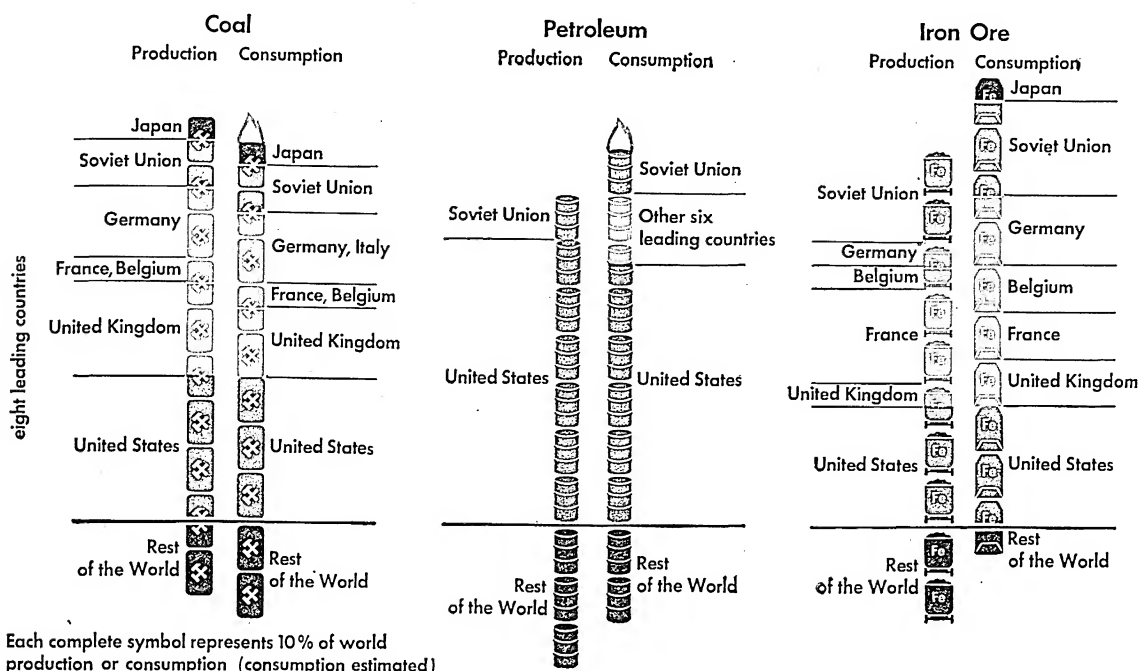
Hoists, called "skips," convey the coal up the main shaft to the top of the breaker house at the mine mouth, where it is dumped down chutes into the "breakers"—an assemblage of screens and chutes—which sort the coal into various sizes and grades. From the breakers the coal falls into bins or dumps and is ready to be taken to market.

In ore mines, other processes take the place of the coal breaking. In many cases the masses and lumps of ore, after being brought to the surface, are crushed, or even ground to powder, often by the pounding of huge hammers in a stamp mill. The valuable part of the ore is then separated from the waste, the process of separation being different in different cases. Where the ore is much heavier than the waste, the separation is brought about through differences in specific gravity. The final extraction of the metal, like the preliminary treatment of the ore, differs with the nature of the ore.

The importance of mining and the dangers threatening miners have led the United States to create

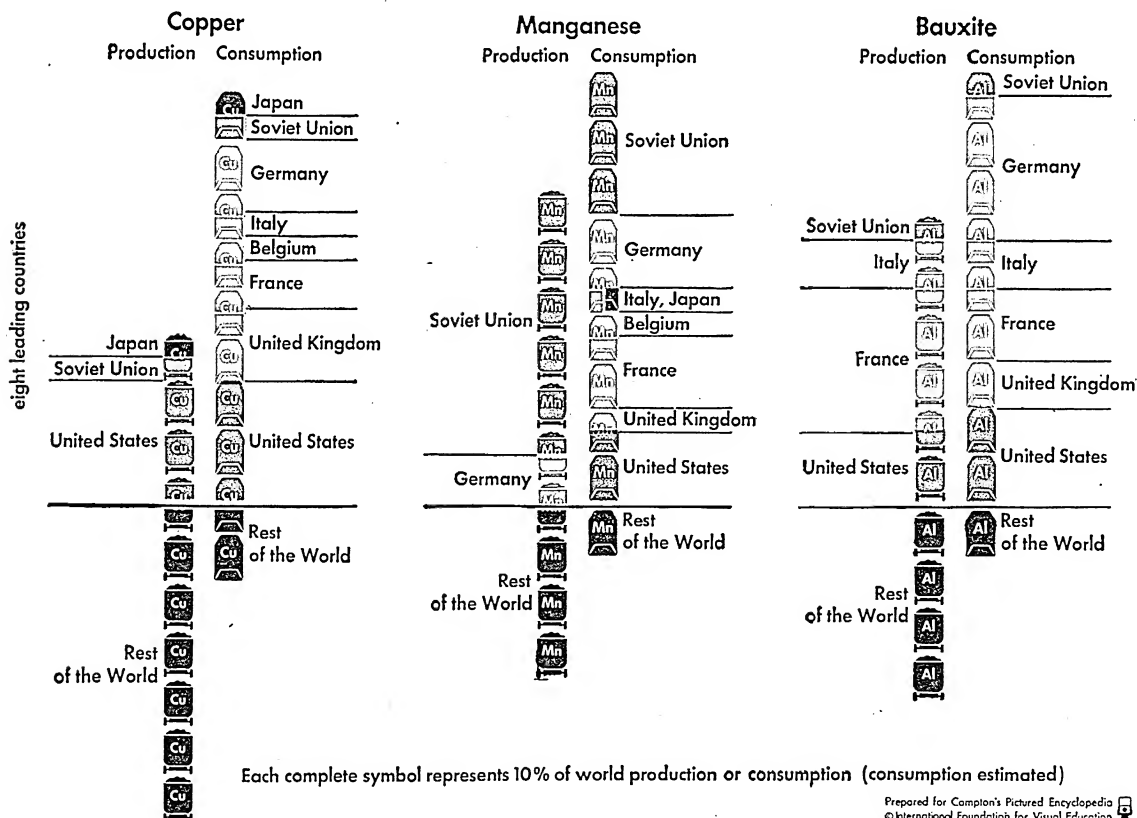
## Percentage of World Production and Consumption

Annual average for 1934-1936



## Percentage of World Production and Consumption

Annual average for 1934-1936



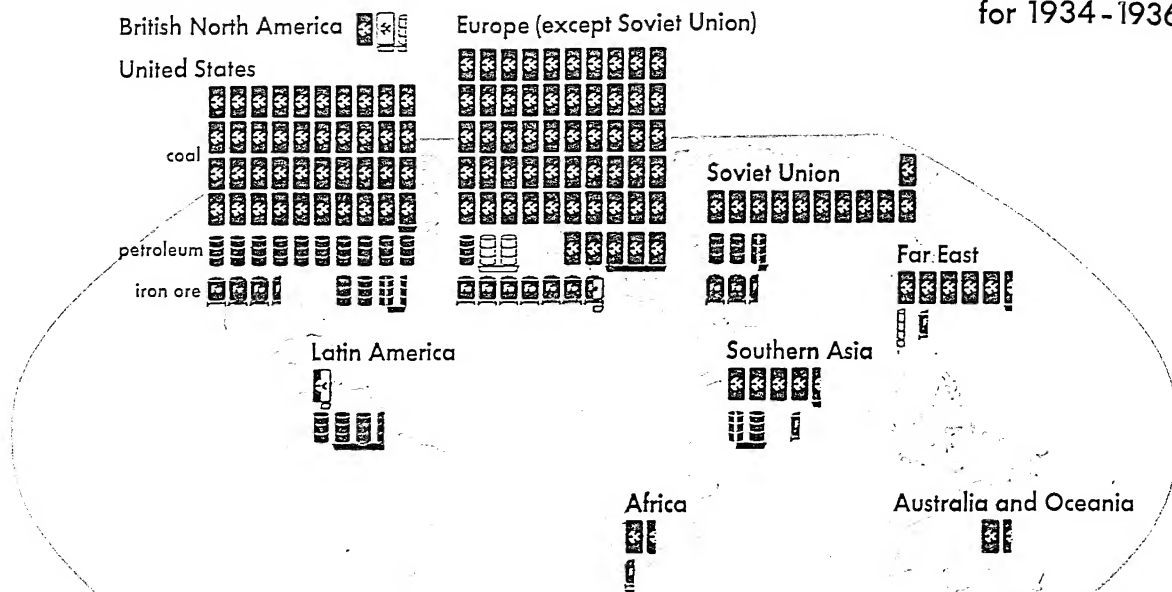
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Industrial nations today are engaged in a struggle for possession and control of essential raw materials. This chart compares the chief mineral needs of eight leading industrial countries with their domestic supply. Notice how well supplied the United States is with all these minerals except manganese. Italy and Japan are poorly supplied and Germany is self-sufficient only in coal. Such facts, taken for a three-year period before war upset normal conditions, help to explain why these nations seek more territory.



# World Production and Trade in Coal, Petroleum, and Iron Ore

Annual average  
for 1934-1936



Each complete symbol represents 10 million long tons (lignite expressed in terms of coal)

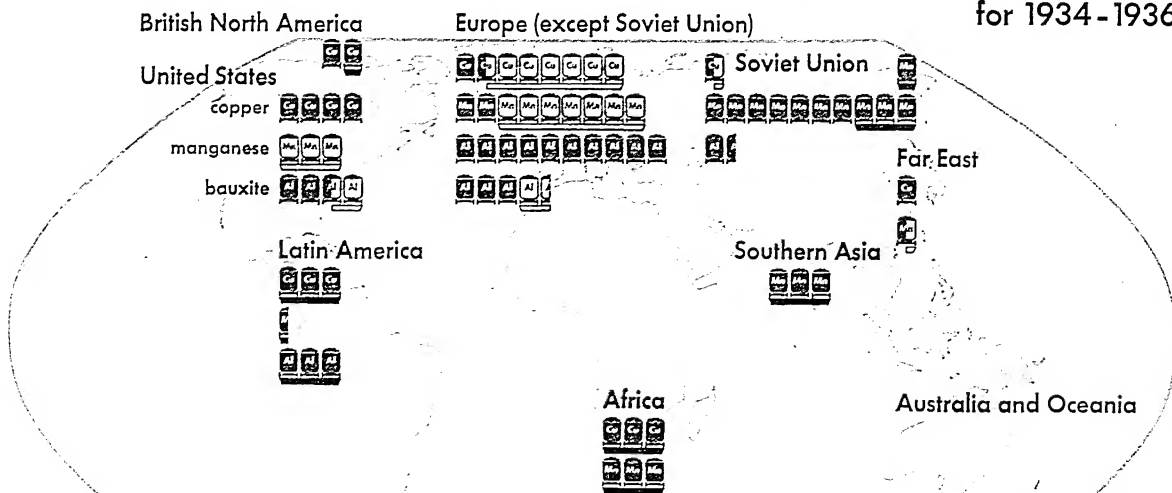
solid, without ship: produced and consumed

solid, on black ship: produced and exported (incl. bunker coal and bunker oil)

outlined, on white ship: imported and consumed

# World Production and Trade in Copper, Manganese, and Bauxite

Annual average  
for 1934-1936



Each complete symbol represents 100,000 long tons

solid, without ship: produced and consumed

solid, on black ship: produced and exported (estimated)

outlined, on white ship: imported and consumed (estimated)

Cu: copper content of ores

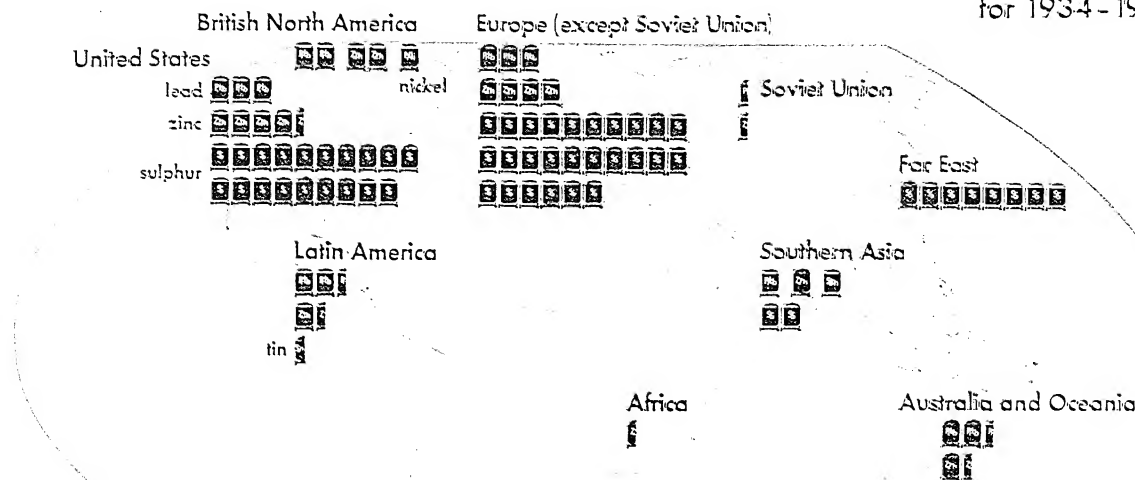
Mn: manganese content of ores

Al: weight of bauxite (aluminum ore)

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Where do the leading industrial nations get the minerals essential to their manufactures? The United States supplies its own needs, except for manganese and bauxite, and has coal and petroleum left over for export. Europe is a large producer, but is self-sufficient only in coal. Latin America, Southern Asia, the Soviet Union, and Africa are all producers for export. The coal and petroleum shown in exports and not accounted for in imports are bunker fuel for ships.

## World Production of Lead, Zinc, Tin, Nickel, and Sulphur

Annual average  
for 1934-1936

Each complete symbol represents 100,000 long tons

Pb: lead content of ores    Zn: zinc content of ores    Sn: tin content of ores  
Ni: nickel content of ores    S: sulphur (brimstone and sulphur content of pyrites)

Prepared for Compton's  
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We see here the regions that mine most of five other minerals indispensable to industry. The United States is the largest producer of zinc, and produces quantities of lead and sulphur, but it must import all of its tin and nickel. Europe's situation is much the same. The data for this chart and the charts on the preceding pages are taken from the 'Minerals Yearbook of the United States Department of the Interior', and the statistical abstracts of various countries.

a Bureau of Mines to study working methods and to train crews in methods of rescue. Much valuable work has already been done by the bureau.

Mining has been so important that man's progress is measured by the metals he has used—copper, in the Copper Age; then bronze in the Bronze Age, when he had found tin and learned that tin and copper made bronze; next came the Iron Age, and then the Steel Age. Now aluminum is so important in our lives that in future centuries ours may be known as the Aluminum Age.

The copper mines of Sinai, worked as early as 5000 B. C., are the most ancient mines of which we know. Mining was not an honorable toil among the ancients, and had to be done by slaves; hence only the conqueror nations worked their mines. There still exist the tunnels, furnaces, crucibles, and parts of tools of the ancient miners.

The mining industry keeps expanding as new mineral resources are discovered and developed and as new uses for minerals in industry are invented. Mines today are built and operated under the direction of highly trained men, called mining engineers. The United States has a number of schools of mining and metallurgy, and many colleges and universities give courses in mining engineering.

**MINK.** One of the most popular and luxurious furs worn by women comes from the mink. This is a long-bodied slender brown animal related to both the weasel and the marten. It is found in widely scattered regions of North America, from the Gulf of Mexico to the Arctic Circle, and in northern Europe and Asia. The American mink is about two feet long, including its eight-inch bushy tail. It has small ears, a long neck, and short legs. Its fur is thick and soft, with long stiff shiny guard hairs which are plucked out by the furrier. The minks of northern regions have the dark-

est colored and most lustrous fur. The European species is somewhat smaller than the common American mink and is also distinguished by its white upper lip. The Siberian mink has a tawny brown fur.

The mink lives along the banks of streams and ponds in the woods or on the plains. It is a skilful swimmer and diver, and hunts its food both in water and on land. It is fond of birds and sometimes climbs trees to rob nests. It also eats frogs, fish, lizards, and grubs. In winter it chases rabbits and muskrats over the snowy ground. It is wonderfully agile in spite of its short legs and can elude almost any pursuer. When cornered, a full-grown mink is a foe to be reckoned with. It fights fiercely and gives off a strong disagreeable odor.

The young begin life in a nest prepared in a hollow log or in a hole among rocks. There is only one litter a year, with usually five or six young, although there may be from three to ten.

Mink raising on fur farms is a growing industry both in Europe and America. It is profitable and the animals are not difficult to raise in captivity. A mink coat is expensive, for the average full-length garment takes from 60 to 70 skins. The fur wears exceptionally well. The "Japanese mink" of commerce is the pale yellowish-brown fur of the Itachi weasel, and is always dyed.

Scientific name of the American mink, *Mustela vison*; of the family, *Mustelidae*. There are a large number of subspecies. The European mink is *Putorius lutreola*.

**MINNEAPOLIS, MINN.** When you visit Minneapolis and see its wonderful sky line of flour mills, you can understand why it has long gloried in the title of "the world's miller." These mills once ground more than 18,000,000 barrels of flour in a year, but the city has now yielded first place to Buffalo. Minneapolis is one of the chief primary wheat markets, and its towering elevators can store more than 90,000,000 bushels of this grain. Power from the Falls of St. Anthony in the Mississippi River turns the wheels of the flour mills and has been a chief factor in the city's industrial growth.

Flour and lumber were the two industries that made Minneapolis the largest city of Minnesota and the Northwest, but they now make up only a small part of its diversified manufacturing production. Linseed oil, dairy products, bread and bakery products, furniture, railroad cars, clothing, automobile bodies and parts, agricultural implements, food preparations, and machinery are leading products.

A dozen trunk railway lines enter the city and make it a distributing center for the Northwest. It is the seat of the Ninth Federal Reserve Bank.

Minneapolis is also a "city of homes." The fine residences, the wide shaded streets, the extensive parks (covering one-tenth the area of the city), the numerous lakes connected by boulevards and water-

ways for small craft, and the healthful climate with its dry cold winters and mild summers, make the city a delightful place in which to live. One of the most interesting spots is Minnehaha Park, in which is found Minnehaha (Laughing Water) Falls, a silvery stream, immortalized by Longfellow, which dashes over a precipice into a shady glen 60 feet below. Lake Minnetonka, 17 miles southwest of the city, is one of the great summer resorts of the Northwest.

As a center of culture, Minneapolis has also attained distinction. It is the home of the University of Minnesota, one of the leading universities of the country, of several denominational institutions of learning, and of the Dunwoody Institute, a large endowed vocational school. The Institute of Arts and the Thomas B. Walker Art Gallery contain collections which rank among the best in the country, and the Minneapolis Symphony Orchestra, maintained by public subscription, is known to music lovers throughout the United States.

The Falls of St. Anthony, to which Minneapolis is chiefly indebted for its prosperity, were discovered and named in 1680 by the Franciscan missionary, Louis Hennepin. The name Minneapolis comes from the Sioux word *Minne* (water) and the Greek word *polis* (city). For half its length on the east Minneapolis adjoins St. Paul. Population (1940 census), 492,370.

## INEXHAUSTIBLE RICHES of the "GOPHER STATE"

**MINNESOTA.** Gold is precious, but iron and bread are indispensable. So far as products go, the world needs Minnesota even more than Minnesota needs the rest of the world. Minneapolis is one of the world's greatest flour-milling cities; some of the most productive wheat lands in the world lie in the Red River valley, which is partly in western Minnesota; and the most productive iron mines in the world are in the Mesabi Range in the northeastern corner of the state. The state has no coal, and its timber has been greatly reduced; so it depends largely on other regions for fuel. But its enormous resources in "white coal," or water power, have been developed only to an insignificant degree, and it has vast supplies of peat capable of being used as fuel.

Neighboring states exceed Minnesota both in average and maximum elevation. Yet, long ago, angry volcanoes towered in this region, ever and again vomiting forth lava floods that spread for many a mile; the lava belched forth by Vesuvius is nothing to the lava-covered area of Minnesota. Battered and rasped for ages on ages by wind and rain and running water and slowly grinding glacier, only the flattened

*Extent.*—North to south, 406 miles; east to west, 357 miles. Area, 84,068 square miles (of which 4,059 are water surface). Population (1940 census), 2,792,300.

*Natural Features.*—Northeastern boundary formed by Lake of the Woods, Rainy and Pigeon rivers; Red River, Lake Traverse, and Big Stone Lake on western boundary; Mississippi River, its tributary, the St. Croix, and Lake Superior form eastern boundary; Minnesota River, tributary to Mississippi. Gently rolling surface broken by Mesabi Range and Misquah Hills in the northeast (highest point, 2,230 feet) and "10,000 lakes" (Mille Lacs, Leech Lake, Red Lake, Little Vermilion Lake, etc.). Mean annual temperature, 42°; mean annual precipitation, 25".

*Products.*—Corn, hay, wheat, oats, potatoes, barley, rye, livestock, poultry and eggs; dairy products; flour and mill products, meat packing, lumber products, machinery; iron, stone.

*Cities.*—Minneapolis (492,370), St. Paul (capital, 287,736), Duluth (101,065); Rochester, St. Cloud, Winona (all over 20,000).

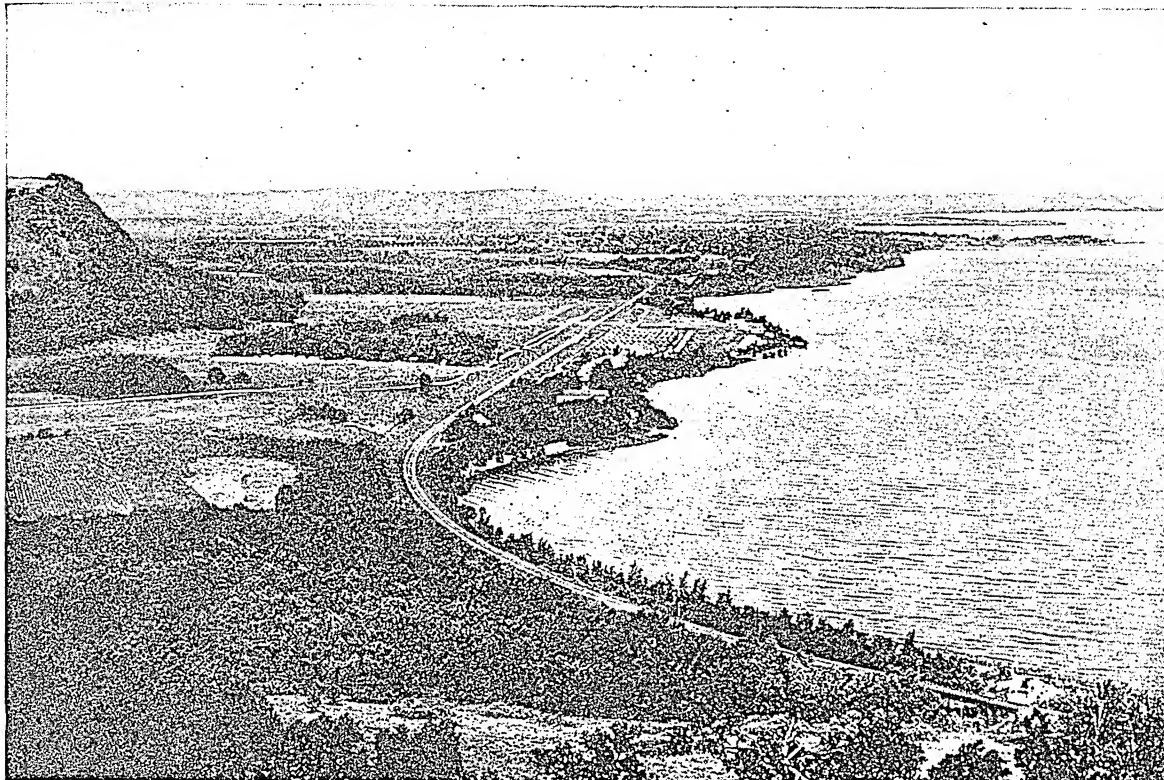
stumps of these ancient mountains now remain. Still, the highlands of the north-central part of Minnesota, seamed with volcanic rock, form a watershed whence water flows to the ends of the continent—into Hudson Bay through the tributaries of the Rainy River

and the Red River; into the Gulf of Mexico through the Mississippi and its tributaries; and into the Atlantic through the St. Louis River, the Great Lakes, and the St. Lawrence. From this forest-belted highland the rolling plain slopes in all directions, to be caught up again to higher elevations at two opposite corners, the Misquah Hills in the northeast and the Côteau des Prairies in the southwest.

In the Dakota Indian tongue, "Minnesota" is said to mean "clouded water." Set thick with thousands of lovely little lakes—more numerous, probably, than any other state can boast—and threaded with streams frolicking over many a waterfall, the state is like a water-soaked sponge. About one-fifth of the surface is swamp land, capable of being drained and exceedingly rich and productive after drainage. The annual rainfall is light, but owing to the amount of moisture in the soil and the fact that most rains occur when



## A BEAUTIFUL DAUGHTER OF THE "FATHER OF WATERS"



Lake Pepin, thirty miles below St. Paul, is really only an expansion of the Mississippi across its flood plain. This great work of Nature's art was produced away back in the Ice Age when the Chippewa River, flowing into the Mississippi from the east, brought down loads of pebbles, sand, and boulders from the melting glaciers, and poured them into the Mississippi. This checked the waters and caused them to widen out into this beautiful mirror of sky and clouds.

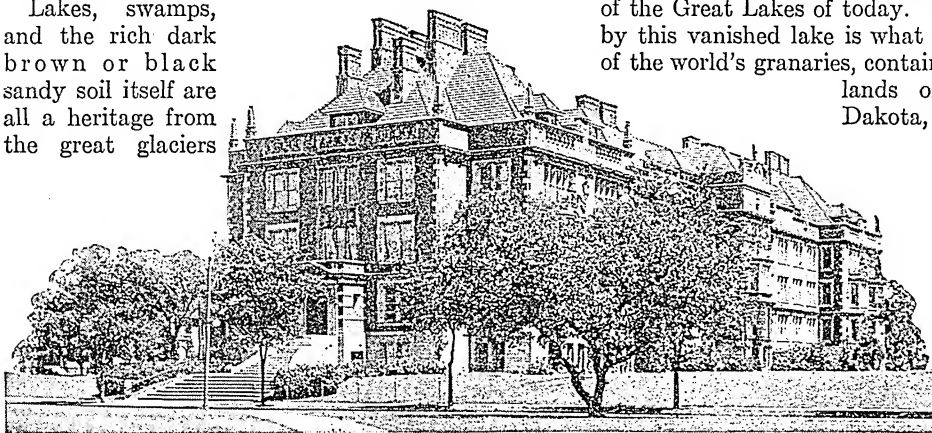
needed in the growing season, it is amply sufficient for splendid crops. Drouth is almost unknown. The expanse of water and the moisture in the soil modify to a certain extent the sudden violent changes in temperature, to which dry inland regions are subject. The snow that blankets the ground throughout the winter is an additional protection to the vegetation, which grows with marvelous rapidity in the spring.

Lakes, swamps, and the rich dark brown or black sandy soil itself are all a heritage from the great glaciers

which, several times during the Ice Age, flowed over practically the whole of what is now the state of Minnesota. Here and there they scoured out basins for water to collect in, and everywhere they scattered the glacial drift. When the last glaciers began to retreat, their melting waters in the region of what is now the Red River valley formed a vast lake (called by geologists Lake Agassiz) greater than any of the Great Lakes of today. The alluvial mud left by this vanished lake is what makes this valley one of the world's granaries, containing the richest wheat lands of Minnesota, North Dakota, and Manitoba. (See

Red River.) In most years of normal harvests, Minnesota is one of the country's four leading states in the production of spring wheat.

Corn is now the leading cereal in southern Minnesota. The two tiers of southern counties, it has been said, might be mis-



This is Folwell Hall of the University of Minnesota. The University has a central location on the banks of the Mississippi within the city limits of Minneapolis, and is an influential factor in American higher education. It also contributes powerfully to the welfare of the state by its training in the professions of agriculture and mining.

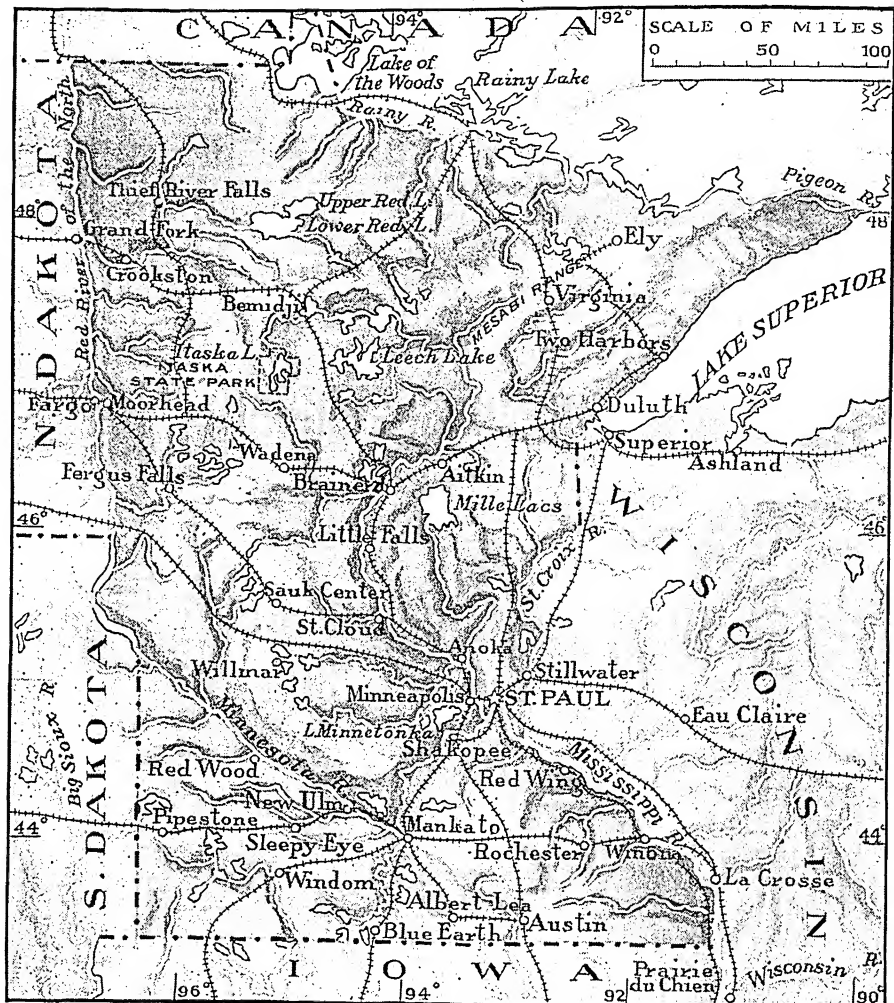
taken for Iowa. Potatoes are an important crop, especially in the central region which is also a great stock-raising and dairying section, giving Minnesota the title of the "Bread and Butter State." Minnesota ranks second, next to North Dakota, in the production of flax (grown for the seed), chiefly in the northwestern part of the state. In northeastern Minnesota, where the development of lumbering and mining has exceeded that of agriculture, hay is the most important crop. All sections, however, practice diversified farming; and all the small grains, fodder and root crops, and most fruits are successfully grown.

The rugged northern part of the state contains the three famous iron ranges—in the northeast the Vermilion and Mesabi, and just north of the center, the Cuyuna. The ore is easily worked hematite; this is the most important part of the famous Lake Superior ore district, which is partly responsible for American supremacy in the world's iron and steel market. Some of the ore is worked up near Duluth, but most is shipped from there and other lake ports to the mills of Illinois, Ohio, and Pennsylvania (see Duluth). In some years more than 60 per cent of the ore mined in the United States has come from Minnesota. Nine-tenths of the output comes from the Mesabi range.

Building stones (granite, sandstone, and limestone) brick-clay, sand, and gravel are the only other minerals of commercial importance. The famous red pipestone—from which the Indians made their pipes—was quarried near the town of that name in the southwest corner of the state.

Water-power and raw materials produced within its borders—breadstuffs, live stock, timber, and iron ore—are the basis of the state's manufactures. Ever since Minneapolis rose to greatness as a flour-milling

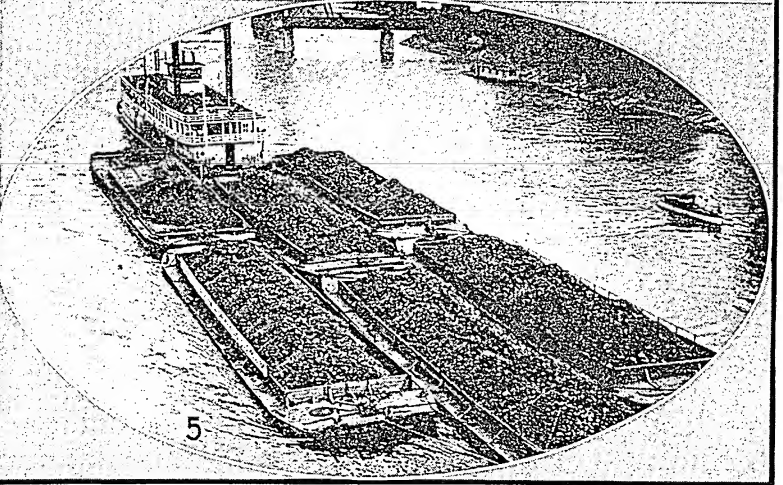
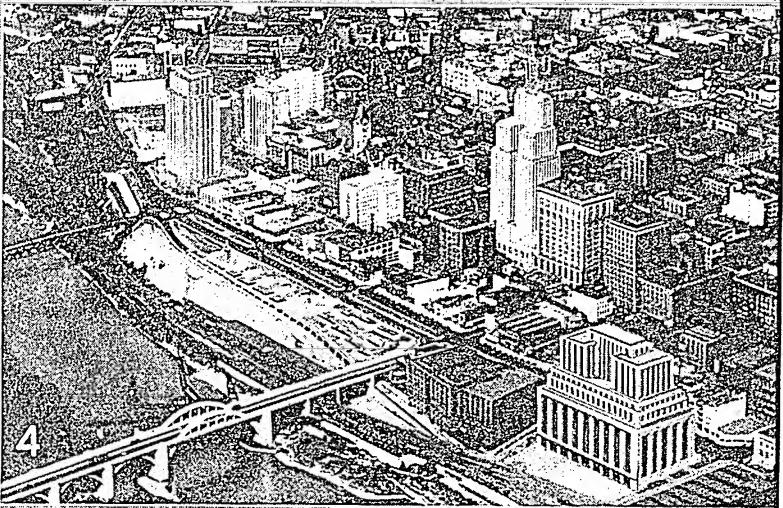
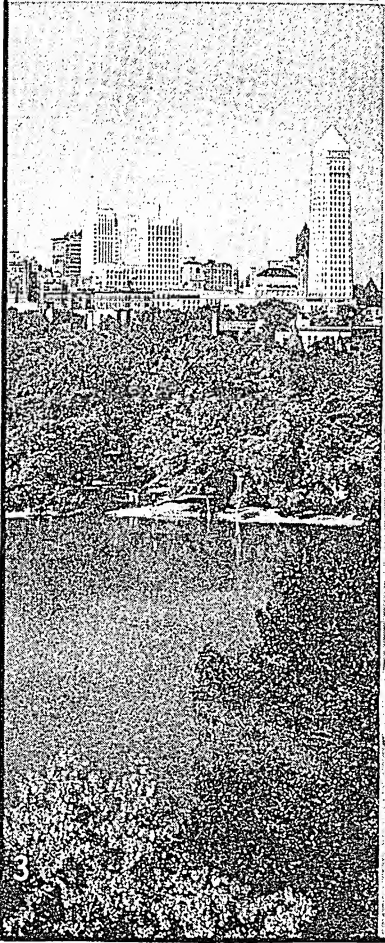
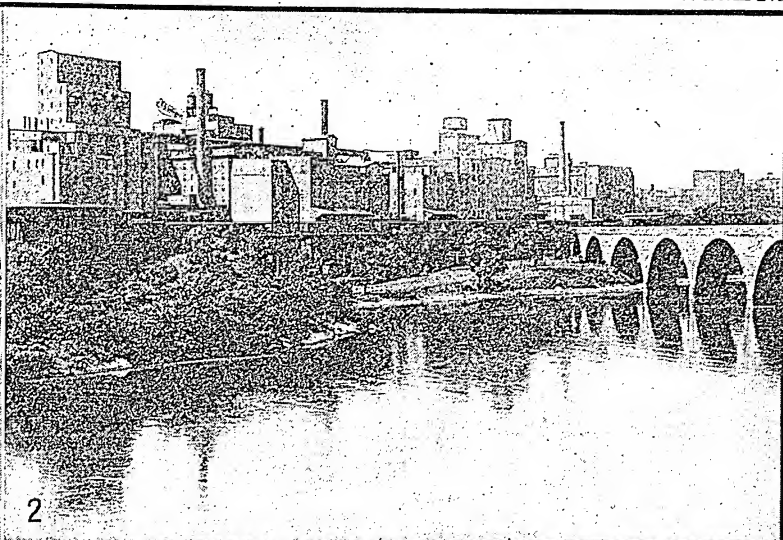
## THE STATE OF FLOUR, CATTLE, AND IRON



The "Twin Cities" of Minneapolis and St. Paul may be regarded as the neck of a funnel into which the state's farm lands pour a flood of wealth. Notice how food manufactures predominate in the products chart. The divided bar at the right compares the chief occupations of the people.



## THE TWIN CITIES AND THE RIVER THAT "MADE" THEM



Minneapolis and St. Paul owe their rise to greatness to the Mississippi River. Power from the Falls of St. Anthony made Minneapolis a flour milling center, and St. Paul's position at the head of navigation made it a railroad and distributing center. Minneapolis's "bread and butter skyline" (2) with its great flour mills is a world-famous sight, and the impressive business sec-

tion (3) indicates the city's commercial importance. St. Paul (4) early became the great wholesale center of the Northwest. Its river freight traffic (5) has greatly increased in recent years. The statue of Hiawatha and Minnehaha (1) stands in Minnehaha Park, Minneapolis. With the Indian girl by its side, it reminds us of olden days when the Indians roamed this beautiful land.



center, flour and other grist mill products have been important. Since the peak years of production during the World War of 1914-18, millers have found it cheaper to manufacture flour nearer the principal markets. Buffalo, as a result, has taken first place from Minneapolis as the world's greatest milling center. While milling declined in value, wholesale meat packing increased until it far exceeded all other industries in value. South St. Paul rivals Omaha as the third largest packing center in the country. In the manufacture of linseed oil, cake, and meal, Minnesota leads the nation. Lumbering and the manufacture of lumber products, once the most important of Minnesota's industries, has lost its former high rank with the thinning out of the forests. The state is, however, protecting the timber that remains and reforesting much land unfit for farming. Lumber (chiefly white pine, spruce, and other soft woods) is manufactured in Minneapolis, Duluth, Virginia, and smaller places. Fur goods and shoes are manufactured chiefly in St. Paul. Iron and steel are manufactured near Duluth. In butter making Minnesota ranks first among the states. Rochester, Minn., the seat of the Mayo Clinic (now affiliated with the University of Minnesota) is as famous among the surgeons of the world as Minneapolis is among the millers.

#### State Owns and Leases Iron Mines

More than 30 of the iron mines are located on state lands, and are leased to the operators. The royalties paid from mines on school lands, together with the sales of the lands and their timber products, have made the Minnesota school fund one of the richest in the Union, and permit the state to offer salaries to attract the best teachers. Hibbing, a village of 15,000 people in the Mesabi Range has been called "the richest village on earth." It gets enough revenue from the mines to support not only a fine elementary and secondary school system but also a junior college. The state university at Minneapolis is one of the foremost state universities in the country.

Minnesota has a high proportion of foreign-born population for an agricultural state, mostly Scandinavians, Germans, Finns, and Canadians. These hardy, thrifty northern stocks have contributed much to the state's prosperity.

Minnesota's constitution was adopted in 1857. The executive department consists of a governor, lieutenant-governor, secretary of state, treasurer, auditor, and attorney-general, elected for two years, excepting the auditor, who serves four years. Other executive officers are appointed by the governor.

In the 17th century the French, eager to extend their profitable fur trade, reached this inland territory by way of the Great Lakes. Two French traders, Radisson and his brother-in-law Groseilliers, are believed to have passed the winter of 1656 near the present site of Red Wing. Three years later they explored the region around Mora, a short distance southeast of Mille Lacs (*see Furs and Fur Trade*). The next notable visit of white men was made 20

years later by Daniel Greysolon (or de Gresolon), Sieur du Lhut (Duluth), with a party of traders and explorers from Quebec and Montreal. They went as far as Mille Lacs, and claimed the land for Louis XIV (*see Duluth*). In 1680, Father Louis Hennepin, who had joined Michael Accault and Antoine Auguelle, sent by La Salle to explore the upper Mississippi to its source, was held captive by Indians at Mille Lacs. When released, Hennepin continued down the Rum and Mississippi rivers and discovered the falls he named St. Anthony. (*See Hennepin; La Salle.*)

#### Le Sueur and Jonathan Carver

Pierre Charles Le Sueur, a Canadian trader, established a post on Isle Pelée, or Prairie Island, in the Mississippi in 1695. He returned to Minnesota in 1699 by the way of New Orleans to mine copper, and near the present site of Mankato built Fort L'Huillier, abandoned in 1702. No trace was ever found of the copper mine Le Sueur claimed to have discovered. During the next 60 years French fur traders and explorers entered the region, but no settlements were made except scattered forts and trading posts.

In 1763, after the French and Indian War, France ceded to England all of Minnesota east of the Mississippi. By a secret treaty in 1762, France had given the land west of the Mississippi to Spain.

Jonathan Carver, a daring Connecticut Yankee who planned to cross the American wilderness to the Pacific, set out from Boston in 1766 and sailed the Great Lakes to Mackinac and Green Bay, crossed to Prairie du Chien, and went up the Mississippi to Minnesota. He spent the winter with a band of Sioux in the Minnesota valley. In the spring he visited the Indian burial grounds where St. Paul now stands. They are still preserved in Mounds Park. Near by is Carver's Cave, a sandstone cavern he explored.

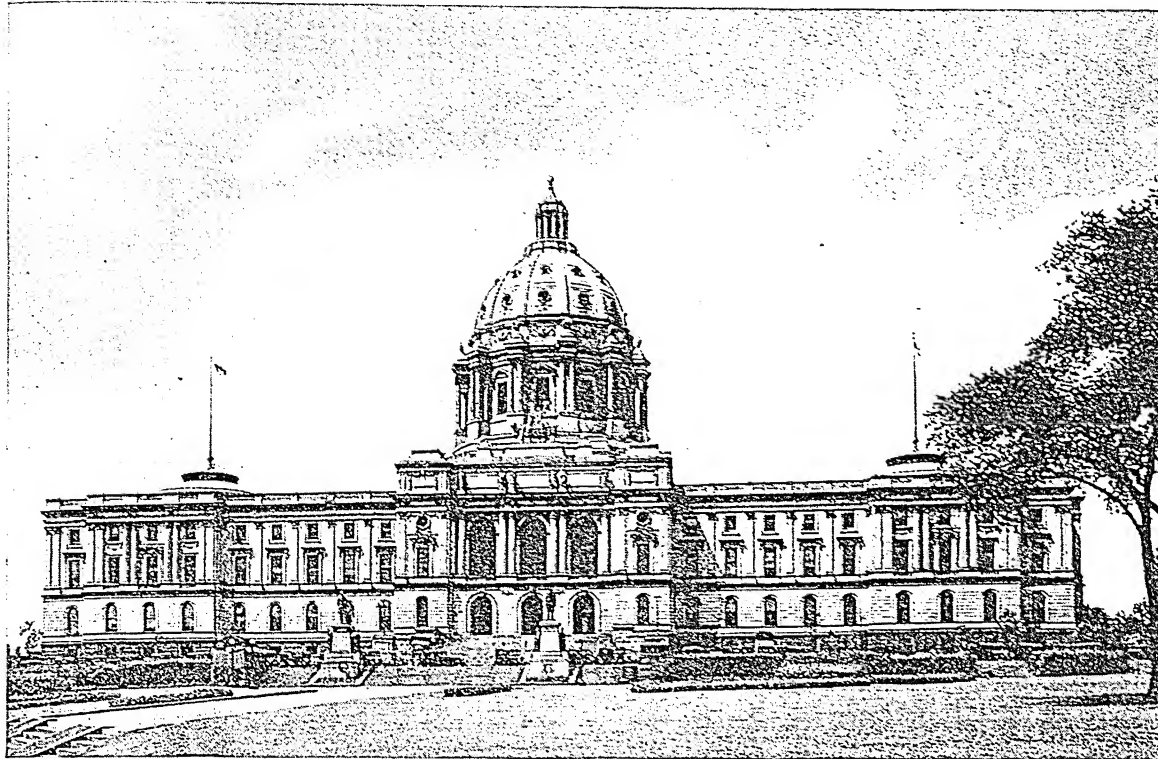
#### Pike Drives Out British Traders

English dominion in Minnesota ended with the Revolutionary War, and the Louisiana Purchase in 1803 added to the United States that part of the state west of the Mississippi (*see Louisiana Purchase*). British fur traders who had remained in Minnesota after the Revolution were driven out by Zebulon M. Pike and his party of explorers in 1805. Pike also made treaties with the Indians and purchased the land on which Fort Snelling was established by Col. Joseph Snelling in 1819.

Maj. Stephen H. Long, sent out by the war department in 1823, circled three-fourths of Minnesota by way of the Minnesota River, Big Stone Lake, Red River, Lake of the Woods, and Rainy Lake to Lake Superior. With him was a young Italian, Giacomo Constantino Beltrami, who left Long at Pembina to seek the source of the Mississippi, but failed.

One of the most famous expeditions into Minnesota was that of Henry Schoolcraft, who was sent twice by the government, the second time in 1832 to make peace between the Chippewas and Sioux. Schoolcraft, with Dr. Douglass Houghton, a botanist and geologist, the Rev. W. T. Boutwell, a missionary, and several

## A CROWNING GLORY FOR CITY AND STATE



Standing on a high hill overlooking the business section of St. Paul, the Minnesota State Capitol ranks with the most imposing structures of its kind in the country. Designed by Cass Gilbert, it was completed in 1905 at a cost of over \$4,500,000. The principal mass is composed of native granite, enriched with white Georgia marble. Daniel Chester French and Edward C. Potter executed the outside sculptures; Edwin H. Blashfield, Kenyon Cox, John La Farge, Howard Pyle, Douglas Volk, and other noted artists decorated the interior.

other eminent men, voyaged over the Great Lakes and landed at Fond du Lac. From there they started the arduous trip inland up the St. Louis River to Sandy Lake, the trading post of the American Fur Company. Stopping at Cass Lake, which they had discovered in 1820, they paddled up the Mississippi, portaging most of the way. Finally they reached Lake Itasca, one of the sources of the Mississippi. Schoolcraft named the lake from parts of two Latin words, *veritas*, meaning truth, and *caput*, meaning head—"true head."

#### Made Territory in 1849

In 1837 the Indians ceded all their land east of the Mississippi to the United States. In 1849, when Minnesota was organized as a territory, it had a population of almost 5,000. This was the beginning of its development and prosperity. Lumber companies started work in many parts of the state, and settlers flocked from the east and abroad. Minnesota was admitted to the Union as a state on May 11, 1858.

In the Civil War the new state sent about 22,000 men to the Federal cause in addition to fighting a war of its own, the Sioux Indian uprising. Led by Chief Little Crow, the Sioux suddenly attacked the white settlements in 1862, and massacred about 350 people. The Indians, finally defeated at Wood Lake on September 22, were removed the next year to lands beyond the Missouri.

**MINT.** The fragrant herb we call mint preserves the name of the beautiful nymph Mintha. The goddess Persephone, so the old Greek myth runs, in a fit of jealous rage turned her beautiful rival into the plant which is now so highly prized for its odor and flavor. These qualities are due to essential oils secreted in little glands in the leaves, which when distilled give us the widely used mint flavors.

Many kinds of mint exist, 12 species growing in America. The most important of these are spearmint or garden mint, used in mint sauces and for flavoring chewing gum; peppermint, from which peppermint oil or menthol is distilled; pennyroyal, used in medicine; and bergamot, whose lemon-scented leaves give a fragrant oil much used in perfumes.

When the first flowers appear, the mint crop is ready to harvest. It is cut with scythes and mowing machines, cured like hay, and distilled with steam. Northern Indiana and southern Michigan furnish over 80 per cent of the oil of peppermint produced in the United States. Some is raised also in Washington, Oregon, California, North Carolina, and New York; in England, continental Europe, and in Japan.

The genus *Mentha*, consisting of perennial herbs, characterized by highly organized cuplike flowers and aromatic leaves, is distributed over many parts of the world. Scientific name of spearmint, *Mentha spicata*; of peppermint, *Mentha piperita*; of horse mint, *Mentha longifolia*. All have creeping

rootstocks, square stems bearing opposite simple leaves, small purple, white, or pink flowers in whorls that often form terminal spikes. The mints belong to the family *Labiatae*, which contains many other fragrant herbs such as sage, thyme, germander, savory, wild marjoram, balm, lavender, rosemary, patchouli, and basil. Catnip or cat mint (*Nepeta cataria*), which cats eat with such relish and which is often steeped to make a medicinal beverage, also belongs to this family. All members of the mint family can be propagated by cuttings or by simply dividing the roots.

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## Where Uncle Sam MAKES METAL into MONEY

**M**INT, UNITED STATES. If we ask "Where does our money come from?" the answer is, "from the mint"—if the money is in nickels, quarters, silver dollars, or other metal coin. Government mints are the only places authorized to make metallic money.

"Making money" is only one activity of the United States government mints. Miners sell their precious metals to the mints. Jewelers and others needing considerable quantities of precious metal get their supplies from the mints, or from dealers who obtain the metal from the mints. Importers and exporters of gold and silver deal, directly or indirectly, with the mints. The mints are, in general, Uncle Sam's "business agents" for managing all governmental interests in the precious metals which are used in making money.

To see how money is made, let us visit the Philadelphia mint, since it is the largest. This mint occupies a huge building patrolled day and night by armed guards. After we have visited the museum and viewed its fine collection of ancient and modern coins, medals, and curios from many lands, a guide leads us through some of the ever-busy departments. We see the die-cutting department, which provides all the United States mints with the dies for stamping the designs on coins. In a branch of this department all medals of a national character—such as the Distinguished Service Cross—are manufactured. We also get a glimpse of the many steel-lined vaults for the storage of coin and bullion. One has a floor space of 5,200 square feet and a storage capacity of 112,000,000 silver dollars—and it has often been filled almost to capacity with sacks of these coins! These vaults were made of more than 3,250,000 pounds of steel, and have special time-lock attachments.

### Making Money

The departments that interest us most are those where the coins are made. From glass-enclosed galleries we may watch the carefully guarded machines minting United States coins or turning out a run of metal money for some Latin American country that has no mint of its own.

Precious metal for coinage comes in bars, called "bullion." These bars are cast to contain exactly the right amount of alloy needed to make the coin durable when passed from hand to hand in everyday use. Silver is alloyed with one part of copper to nine of silver. After the bar has been tested by assaying, it is melted, and the molten metal is cast into ingots. These are passed 18 or 20 times through hardened steel rollers until they become strips just thick enough so that each coin cut from them will have the right weight. The strips are fed through cutting machines,

which have vertical punches acting like biscuit cutters. Each punch bites out 225 coin blanks, or *planchets*, a minute. Each planchet is inspected and weighed by automatic scales; then it goes to a milling machine. Here a revolving wheel forces up a "lip" around the edge.

Now each blank is annealed, or softened, by heating until cherry red, then chilling in cold water. These processes usually oxidize some of the copper, producing a dirty film, which is removed by an acid bath. After being cleaned, the blanks are ready for coining. In the coining room the blanks drop through tubes into the coining presses. Automatic "fingers" center them between two powerful dies, one for the "obverse"—the side bearing the date—and one for the "reverse." The dies come together with a pressure of 100 tons to the square inch (for large coins), making a perfect impression. "Milling" is done by cutting grooves around the raised edge. Finished coins clatter into a pan, 80 to 120 a minute. After final inspection and weighing, they are placed in canvas sacks for storage, or for delivery to the Treasury or to banks through the Federal Reserve system.

### Coining in Olden Days

These precise modern methods are an immense improvement on early ways of making money. In Asia Minor and the ancient city-states of Greece, coins were usually made by "striking" the smooth gold or silver blanks between engraved dies of bronze or hardened iron or steel. One of the dies bore the design for the face and the other that for the back of the coin. Only rarely were coins cast in molds; and today casting is the sure sign of the counterfeiter. Beautiful specimens of the ancient coiner's art in our museums are the joy and wonder of every true artist.

In the Middle Ages the same methods were employed—striking engraved dies or punches upon the metal with a hammer. The blanks were prepared at times by casting, and at times by hammering the metal into sheets on an anvil and cutting out the disks with shears or a round punch. Hand hammering was superseded by the mill and screw press about 1662. The "milled" edge was adopted to protect the coin against being clipped and to make stacking easier. Modern machinery was developed in the 19th century.

### Problems in Making Money

Modern methods owe much of their success to secret methods, especially in alloying. To prevent loss of precious metal, even floor sweepings are treated. One particularly difficult problem has been making pennies that would not tarnish. The French solved this difficulty accidentally, when they melted



church bells for copper after the Revolution of 1789. The bell metal (95 per cent copper, 4 per cent tin, and 1 per cent zinc) proved to be an excellent "coinage bronze."

To insure honest weight, the law sets extremely close limits of weight for coins of precious metal, both in fineness and in total weight. The standard limit of fineness has been one part in 1,000 for gold, and two parts in 1,000 for silver. Silver coins may vary  $1\frac{1}{2}$  grains in weight.

American mints are controlled by a branch of the Treasury Department called the Bureau of the Mint, with a Director in charge. Money is coined at the coinage mints in Philadelphia, Denver, and San Francisco. These mints also assay precious metals and conduct transactions in bullion gold and silver, as do the United States Assay Offices controlled by the Bureau in New York City, New Orleans, and Seattle. Assay offices are maintained also in Boise, Helena, Salt Lake City, and Carson City.

Congress established the United States Mint April 2, 1792, as a separate department of the government. It came under the Treasury in 1873. The first United States money made was copper pennies, coined in 1793. Silver dollars were made the next year, and gold eagles (\$10 pieces) in 1795. The largest gold pieces coined were six hundred \$50 pieces struck as mementos of the Panama-Pacific International Exposition. (See also Counterfeiting; Money.)

**MIRABEAU** (*mē-rā-bō'*), **COUNT** (1749-1791). To the noblemen of France, in 1789, the brilliant but dissolute Honoré Gabriel Riqueti Mirabeau must have seemed a traitor to their class, for in the Estates-General of that year, to which he was elected, he acted as a leader of the Third Estate, or common people. But Mirabeau had learned by personal experience something of the evils of the old government; and when the nobility refused to elect him as a representative, he turned to the Third Estate, that he might not be deprived of helping in the changes so badly needed.

Mirabeau's father, an eccentric nobleman, heartily disliked him because of his ugly face, scarred by smallpox, and the wild life of his youth. Several times the father had secured from the king orders for the imprisonment of his wayward son, possibly to keep him out of mischief, and one of Mirabeau's first writings was against these arbitrary arrests by *lettres de cachet*.

In the Estates-General, Mirabeau first attracted attention by openly defying the king. Louis XVI had sent a command to the members of the Third Estate for them to retire from the hall in which they were sitting to their old separate place of meeting. But Mirabeau replied to the messenger: "Go tell your master that we are here by the will of the people, and that we shall be removed only at the point of the bayonet." From this time his influence in the assembly was great. His fire and dash, and his stirring words, won for him the titles of the "Tribune of the People" and the "French Demosthenes."

His statesmanship, however, saw clearly the dangerous direction in which the Revolution was going. In order to save the country from impending disasters, he undertook secretly to advise the king with counsels of moderation. But the king and queen detested Mirabeau because of his former life and

because he took money for his advice, and they refused to be guided by his counsels. Thus his attempt to establish a constitutional monarchy, such as England had, failed. He was elected president of the famous "Jacobin Club" in 1790, and shortly afterward president of the National Assembly.

At length, worn out by his work and his dissipations, Mirabeau died in 1791. His death removed the only statesman who could have guided the Revolution through the coming troublous times, a fact which Mirabeau clearly recognized when he exclaimed just before his death: "I carry with me the ruin of the French monarchy."

**MIRACLE-PLAYS.** In the Catholic church the celebration of the Mass and the special services for the festivals have many dramatic elements. In the Middle Ages these services were made more popular and more instructive by the use of living pictures, or tableaux,—as, for instance, the representation of the Child in the Manger surrounded by the Wise Men. It was a natural step from tableau to acting, first in dumb show, and then with appropriate songs and dialogues. This was the origin of the "mysteries" and "miracle-plays." As far back as the 10th century we find simple plays of this kind, though the earliest play mentioned by the name is the 'Play of St. Katherine' produced in England in the 12th century.

At first the language used was Latin, but later this was changed to the language of the people—English or French or German, as the case might be. As the plays grew in length and elaborateness, they were transferred from the church to the churchyard, and then to the village streets. Once outside the church, secular and comic elements were added. In the 13th century these plays came little by little to be taken from the hands of the clergy, and by the latter part of the 14th century they were acted almost entirely by the different guilds, or unions of craftsmen. These guilds went from street to street with large wagons, called "pageants," on which they set up a stage with rude scenery. The Creation, Noah and the Flood, Adam and Eve, Abraham and Isaac, and other stories of the Old Testament were presented, as well as incidents in the life of Christ. Strictly speaking, these representations of stories from the Bible were the mysteries, while the miracle-plays dealt with the lives of the saints, but this distinction was not always observed. Closely associated with these plays were the *moralities*, in which moral lessons were taught by representing virtues and vices as persons. One of these old plays, entitled 'Everyman', has been recently revived.

Most of these plays, which originated as a means of religious and moral instruction, became so corrupted by jests and vulgarities that they were condemned by the church, and after the 15th century almost ceased to be given. But the pure type of mystery is still preserved in the beautiful Passion Play, which is presented once in every ten years in Oberammergau in upper Bavaria. (See Drama.)

## SEEING SHIPS SAILING THROUGH THE CLOUDS



Why do we sometimes see mirages of huge ghostly ships sailing across the sky? The question puzzled men for centuries but now we have an answer. Somewhere above the ship is a layer of heated air. The lower side of this layer acts as a mirror and reflects the image of the ship below, so that the light rays seem to be coming from somewhere in the sky. If there are several layers, more than one image may be produced.

**MIRAGE** (*mē-rāzh'*). Travelers over burning desert sands sometimes think themselves nearing an oasis because they see in the distance green palms growing about cool water. They urge their camels forward only to find that the vision fades before their eyes, for it is only a reflection, or air picture, of an oasis far away below the horizon. They have seen a mirage.

To understand the cause of a mirage it must be remembered that we see an object by rays of light reflected from it to our eyes, and in the straight line

in which the rays enter the eye. Ordinarily these rays come to the eye in straight lines from the object and we see only objects above our horizon. Now in the case of a desert mirage the rays of light passing upward from an object below the horizon are reflected back from a layer of denser air above the hot light air next the sand. This higher layer of dense air acts as a mirror and, being above the object it reflects, this object appears above the horizon and in the sight range of the traveler, when in reality the object

## THE HEART-BREAKING VISION IN THE DESERT



Who has not heard of thirst-maddened travelers in the Sahara suddenly seeing a tempting vision of a cool oasis, which vanishes at their approach? Usually the mirage is accompanied by an inverted duplicate, which looks as though it were mirrored in the sand. Desert mirages are the reverse of ocean mirages, being caused by the reflection from a layer of cool air above the hot surface air.

itself is miles away and out of sight. But this is not all, for the air layers vary in density and sometimes reflect a double image, one upside down.

In the ocean mirage a vessel below the horizon is plainly reflected in the upper air. A most remarkable ocean mirage was seen in 1854 on the Baltic, when the English fleet of 19 vessels 30 miles away was distinctly seen floating in the air. The case of the ocean mirage, which occurs in the cold northern waters, is just the opposite of the desert mirage, for the cool dense air is close to the water and the reflection is caused by a warmer layer of air above it.

Still another form of mirage is known as "looming." In this the objects seen are magnified and sometimes, when the sun is in just the right position and the sea and the air help, are set against a background of colored mists. This form of mirage is common in the straits of Messina. People of Reggio, looking toward Sicily, may see castles, trees, and men suspended above the sea. This vision is a reflection of the city of Messina, though for long years it was thought to be a city of fairy castles and so was given the name "Fata Morgana," by which name it is still known.

**MIRRORS.** In prehistoric times the only mirrors were pools or lakes. Later highly polished metal mirrors were made, such as the bronze mirrors of the Egyptians, Greeks, and Romans, and the mirrors of the modern Japanese. Similar to these were the unbreakable "trench mirrors" used in the World War. Not until the 13th century were mirrors of glass with backs of lead or tin manufactured. In the 17th century the Venetians made a vast improvement by mixing mercury with the tin for the reflecting surface. Although the mercury fumes killed many workmen,

and weeks were required to complete a mirror, the method was in common use until about 1855, when the modern process of backing mirrors with nitrate of silver was patented. The mercury process is still occasionally used for cheaper mirrors.

Today a mirror of any size can be made in about an hour. For the best mirrors, plate glass about a quarter of an inch thick is used. This is cut to the proper size with a diamond-pointed instrument. Then it is beveled with sand and water in a "roughing mill," polished on emery wheels, and smoothed with fine sandstone and buffers of thick felt covered with rouge. Next, in the silvering department, it is cleansed and placed on heated and blanketed tables. A diluted compound of nitrate of silver, ammonia, and tartaric acid is poured over it, the heat from the table helping the silver to adhere to the glass. The silver back is dried, and then shellacked or painted. Silvered mirrors reflect 20 to 25 per cent more of light than those backed with mercury.

In the ordinary flat surface or plane mirror, your image appears erect, and as far behind the mirror as you are in front of it. But for scientific and other purposes curved mirrors are often made—convex, concave, etc. Curved mirrors reflect distorted images, and so are often seen in amusement halls and parks. When you look into a concave cylindrical mirror you see yourself as very tall and lean, while a convex mirror makes you look shorter and fatter than any little brownie.

The mirror-making industry is of great importance in both Europe and the United States. In the latter country it is centered in Chicago, whence mirrors are shipped to Canada, Mexico, South America, and other foreign as well as domestic points.

## THE BAYOU STATE *and Its Cotton, Corn, and Timber*

**MISSISSIPPI.** A fortunate combination of basic resources gives Mississippi the foundation for a well-balanced economy. Here are abundant sunshine and rainfall, a long growing season, and rich

soil. Here are 16,000,000 acres of forest land, enormous supplies of nonmetallic minerals, ample fish and game. For more than a century the state produced much cotton and timber, and little else. Now it has learned to diversify its agriculture and to balance agriculture with industry. Between 1930 and 1935 it reduced its cotton acreage by one-third, and increased the food and feed crop acreage and the number of cattle by two-thirds. New industries were encouraged by five-year tax exemptions and other concessions. New uses in industry were found for farm waste products. In 1938, for the first time, manufactures exceeded agriculture in value.

*Extent.*—North to south, 326 miles; east to west, 186 miles. Area, 47,716 square miles. Population (1940 census), 2,183,796.

*Natural Features.*—Surface, low, flat, and in places swampy (highest point, 806 feet); eastern rivers flow into Gulf of Mexico, western streams into Mississippi River. Other rivers: Yazoo and Big Black; Pearl, Pascagoula, and Tombigbee. Mean annual temperature, 65°; mean annual precipitation, 53".

*Products.*—Cotton, corn, hay, sweet potatoes and other vegetables, sorghum, sugar cane; cattle and dairy products, hogs, poultry; lumber and timber products; cottonseed products; tung oil.

*Cities.*—Jackson (capital, 62,107), Meridian (35,481), Vicksburg (24,460), Hattiesburg (21,026), Laurel (20,598).

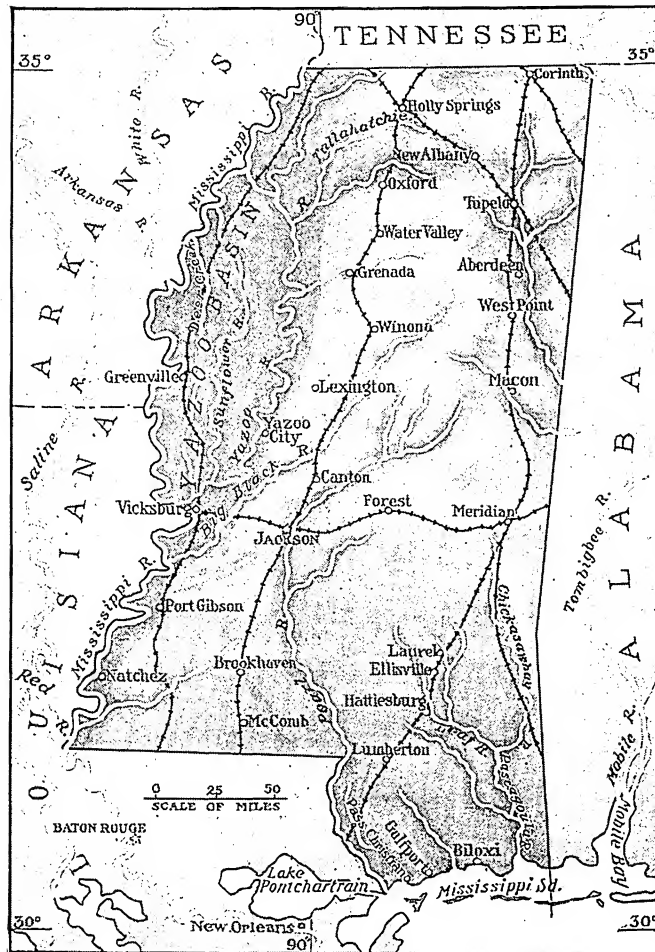
The state has a varied topography. Along the Gulf of Mexico are the Coastal Meadows, a low, flat, swampy region unsuited to agriculture. Here the tourist industry is the chief resource, for

the mild winters bring many visitors to enjoy the fine fishing and other sports. To the north are the Piney Woods, a sandy area covered with slash and long-leaf pine forests. Fruit, pecan, and tung orchards and truck farms are found here. New factories utilizing farm and forest by-products have sprung up at Laurel, Hattiesburg, and other cities.

To the west, and extending the length of the state, is a broad, low ridge broken by narrow valleys, known as the brown loam and loess hill region. With its rich soil it is a highly productive agricultural area. The hills drop from 150 to 250 feet on the west to the delta, one of the most fertile areas in the world,



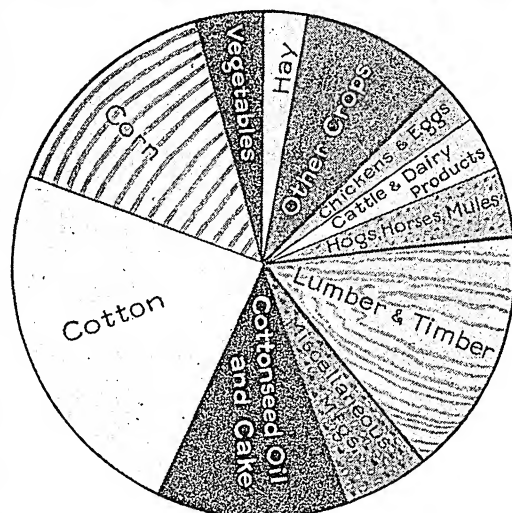
## A STATE RICH WITH FARMS AND FORESTS.



built up through the ages in layers of richness by the Mississippi's floods. It covers a strip of about 7,000 square miles between the Mississippi and the Yazoo rivers, lying so low that a continuous line of dikes is necessary to protect it from the waters. For more than a century this region has been famous for its fine long-staple cotton, which was for years the sole crop. But the ravages of the boll-weevil have made crop rotation necessary, and now corn, soy beans, velvet beans, alfalfa, and other forage crops are extensively grown. There are probably few regions better adapted to stock raising, which is a growing industry. Most of the land is held in large plantations owned by whites and worked chiefly by negroes. The black soil prairies of the northeast, the brown loam and loess of the west, and the smaller river valleys are scarcely less fertile.

Cotton is also grown in large quantities on the Alabama border, and there is indeed hardly a county which does not contribute to this chief crop of the state. Corn is next in importance. Sweet potatoes are everywhere grown, taking third place in some years. Sugar cane makes a good crop in some places,

## AGRICULTURE



In the Yazoo Basin, built up by the Mississippi and Yazoo rivers, Mississippi possesses one of the richest soils in the world. The district along the Alabama border produces cotton, and truck growing prospers along the Gulf coast. The second largest city and chief manufacturing center is Meridian. Above we see the relative value of the state's products and the relative number of people engaged in various occupations.

oats and wheat are grown in the northeast quarter, and rice in the southwest. "Truck" crops of all kinds and all the fruits of temperate climes thrive here, and are sent to the markets of the north by the trainload. For years the cultivated pecan trees in the southern part have supplied the market with the highest quality of large "paper-shell" pecans.

One reason for the success of agriculture is the abundance of water. The atmosphere is humid, the rainfall ample, and the streams never failing. In addition, large numbers of artesian wells furnish pure drinking water, an important factor in promoting the general health.

Good water supply and good pasturage for nine or ten months of the year make a combination favorable to beef production and dairying. "Scrub" cattle and "razor-back" hogs have largely been eliminated from Mississippi farms. Beef, pork, and butter are now produced from high-grade stock. Sheep are grazed on the "cut-over" timber lands.

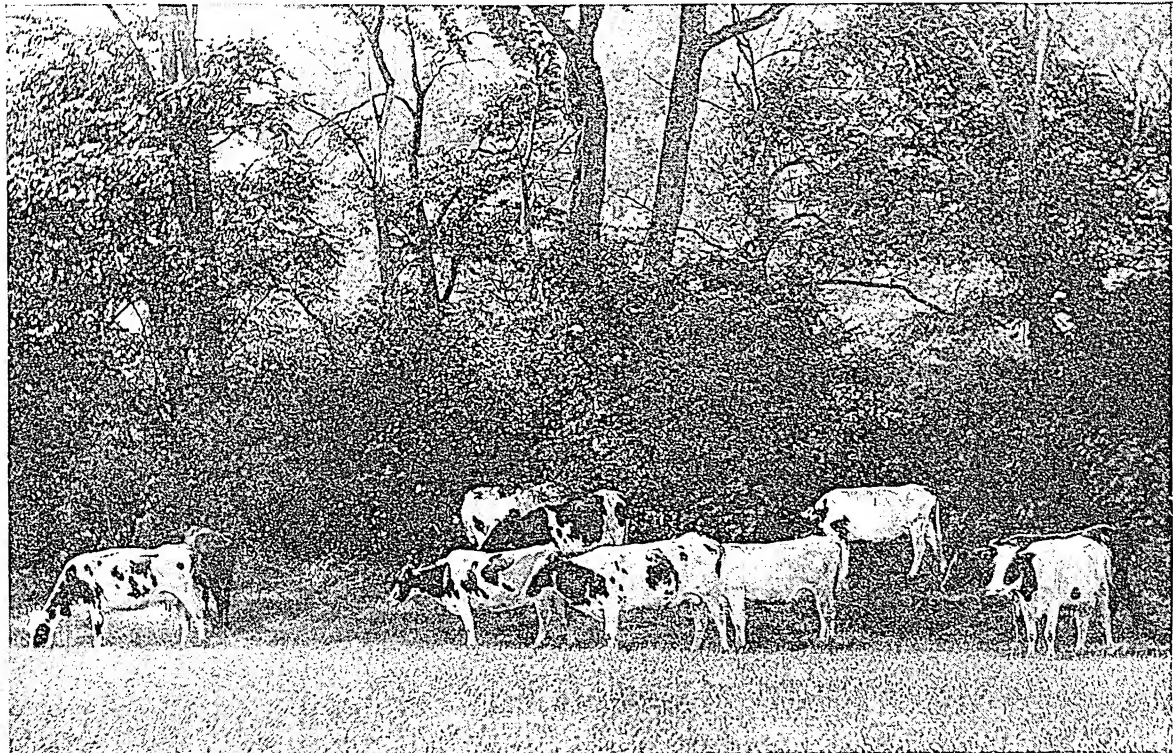
The cooperative system is much used in marketing farm produce. Improved roads are another aid to successful marketing and profitable farming; several thousand miles of good gravel highways have been constructed in recent years.

Second to agriculture in importance are the industries connected with lumber. Hundreds of sawmills turn large quantities of timber into lumber each year,

## RICH FARMS AND PASTURE LANDS

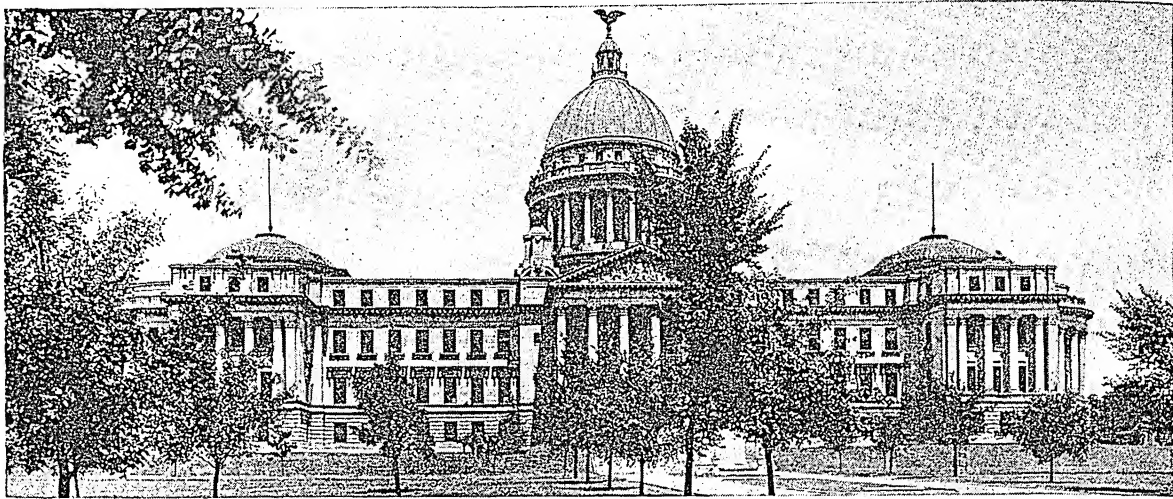


Here is a cutting of alfalfa from a field in the rich delta land adjoining the Yazoo and Mississippi rivers. This land, formed originally by mud carried by the Mississippi from more northern regions, and deposited during the overflows, is said to be unsurpassed in richness, exceeding even that in the world-famous valley of the Nile. The region produces other crops in abundance, and has long been famous as one of the greatest cotton-growing districts in the world. The increase in the number of small farms and the diversification of crops have added greatly to the value of its products, and thereby to the wealth of the state.



This view is typical of another phase of Mississippi. Against a background of trees, such as those which cover the greater part of the state, is a herd of Holstein cattle. Mississippi's dairy cattle have increased greatly in number in recent years, and dairy products are becoming increasingly important in the list of the state's industries.

## MISSISSIPPI'S CAPITOL AT JACKSON



The new State Capitol was finished in 1903. The older building which it replaced was of considerable historical interest, for it had been in service since 1839 and had seen many stirring events.

and charcoal, tar, creosote, and turpentine are manufactured as by-products from the pine stumps and waste limbs. Some paper is also made. Cottonseed-oil, oil cake, cotton goods, and fertilizers are other manufactures of importance. The fishing industry is growing steadily. Considerable quantities of oysters and shrimps are shipped annually from Biloxi on the Gulf of Mexico. Mineral waters and clay are widely distributed. Brick, tile, terracotta, etc., are produced in large quantities. Deposits of lignite (a low grade of coal), limestones, and other building stones are awaiting development.

The cities have a little less than 20 per cent of the population. Jackson, the capital and largest city, is the manufacturing and commercial center for a rich agricultural and lumbering region. Meridian, second in size, has similar interests. Vicksburg, attractively situated on the Mississippi River, has some manufactures and is noted for its cotton trade. Natchez also is an important cotton shipping port. The coast towns are noted as winter resorts, particularly Biloxi, Pass Christian, Ocean Springs, and Gulfport. The University of Mississippi, situated at Oxford, was opened in 1848. An agricultural college and several experiment stations are maintained by the state.

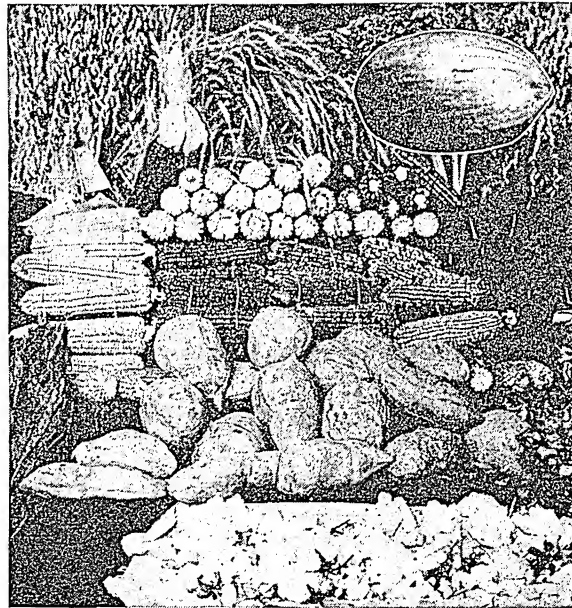
The first European to enter what is now the state of Mississippi was the Spanish explorer De Soto, about 1540. La Salle claimed the country in the name of France in 1682; and the French established a fort

near Biloxi in 1699 and another at Natchez in 1716. Part of the region was ceded to Great Britain in 1763 and passed to the United States in 1783 at the close of the American Revolution. Spain, which had sent troops to occupy the region in 1781, promptly evacuated part of the region, and surrendered the remainder in 1795. Mississippi became a territory in 1798, and a state in 1817.

During the Civil War a large part of the state was devastated by the contending armies (see Vicksburg, Battle of). For five years after the state was readmitted to the Union in 1870, political strife retarded the work of reconstruction. Since then the state's economic

development has been steady. Although a great system of levees has been constructed to protect the river district from the peril of floods, a \$46,000,000 loss was suffered in 1927. The present plan of government, based on the constitution adopted in 1890, provides for electing state officers every four years. The initiative and referendum are in force. Special laws protect children and adult factory workers.

## FROM MISSISSIPPI FARMS



The pecan nut in the upper corner is a leading Mississippi product. Cotton, corn, and garden truck are other important sources of wealth.



*The MIGHTY "FATHER of WATERS"*

A View of the Mississippi from the Bluffs near Red Wing, Minnesota

**MISSISSIPPI RIVER.** The Mississippi River, the "Father of Waters," is the greatest river in North America and one of the longest in the world—3,988 miles from the headwaters of its branch, the Missouri, to the Head of Passes in the delta. (The "passes," which empty into the Gulf of Mexico and old meanders, now cut off, made the length about 4,200 miles.) The drainage basin extends from western Pennsylvania to Idaho, embraces two-fifths of the United States, and is second in size only to the valley of the mighty Amazon. The greater part of this vast region is enormously fertile, which, combined with the latitude, elevation, and rainfall, makes of the Mississippi valley an ideal dwelling place for man, not excelled anywhere on earth. Sixty million people dwell in the states drained by this mighty river, which comprises an area equal to half of Europe.

Early Spanish explorers in the Gulf of Mexico had noted the mouth of this great river and named it the "River of the Holy Ghost." But Hernando De Soto is usually considered its discoverer, for he not only encountered its widely muddy stream in his explorations in 1541, but died upon its banks and was buried in it, leaving his party to float down the great river to the Gulf of Mexico, to escape the hostile Indians. More than a hundred years passed before other white men saw it, when (in 1673) the brave and determined Frenchmen, Marquette and Joliet, descended it as far as the mouth of the Arkansas River. It remained for La Salle and his party, in 1682, to follow the river to the Gulf. Starting from the headwaters of the Illinois River, they pushed their intrepid way first

through floating ice and then down the mighty stream, past the mouths of the Missouri and the Ohio, down the great bends lined on either side with dense forests, through the marshy delta, with its three branches, until they reached the Gulf—"lonely as when born of chaos, without a sail, without a sign of life." Two years earlier Hennepin, sent by La Salle, had explored the upper river from the mouth of the Illinois to the Falls of St. Anthony, where Minneapolis now stands. Not until another hundred years had passed, in 1832, did Henry Schoolcraft follow the Mississippi proper to its source in several small Minnesota lakes, including Lake Itasca.

As it issues from the cool clear waters of Lake Itasca, the Mississippi is only a little stream, 10 or 12 feet wide, and about two feet deep. For a time it rushes north, over rapids and around bowlders, with reed, flags, and watergrass growing profusely on its banks and in its crystal waters. After much twisting and turning, it settles into its southeasterly flow. Tributaries join it, often as large as the river itself, until it reaches a width of 1,200 feet at the Falls of St. Anthony. Here the river descends about 65 feet in three-quarters of a mile, forming rapids, in the midst of which rears a precipice 18 feet high over which the river once plunged in a beautiful cataract. Now this water-power has been used to build up the manufacturing interests of Minneapolis.

The banks of the stream presently rise in rocky bluffs, sometimes as high as 500 feet, and continuing almost to the junction of the Ohio River. The distance between the two lines of bluffs varies from

three to eight miles, and the river wanders back and forth between them sometimes touching one side, sometimes the other. Along most of the way the centuries have built up gentle slopes at the foot of these bluffs, covered with trees and grass to the water's edge; but here and there the cliffs rise straight up from the water in great towering palisades of rugged beauty. Where the Chippewa River flows into the Mississippi, 77 miles below St. Paul, the river spreads out over the entire valley, forming beautiful Lake Pepin, 25 miles long and two to three miles wide.

#### The Ancient Mississippi and the Vanished Sea

At Cape Girardeau, 38 miles above the mouth of the Ohio, the bluffs cease and the great alluvial valley, which the river has built, begins. Long ago an ancient gulf extended up as far as the lower edge of the bluffs, and just as the Mississippi now pours its silt-laden stream into the Gulf of Mexico, in these early days it poured it into this sea, gradually filling it up until it has built for itself a vast valley of soil as fertile as the valley of the Nile and four times as large. In the 200 years of which we have a record, this mighty river has extended the land area only about a third of a mile, so you can see what an immense amount of time has been needed for this larger task.

In the lower bottomlands of the Mississippi there is a strange condition—the surface of the surrounding country is usually lower than the surface of the water. As the river flows in its channel, it deposits sediment on the bottom and at the sides all the time, thus building up the bed of the river so that the stream would overflow were it not for the fact that the same process is also constantly elevating the banks. The result is that the Mississippi flows down to the Gulf on a broad ridge which it has built above the surrounding land. Finally it enters the Gulf of Mexico through the delta—a marshy impassable area of more than 12,000 square miles, with its three great arms or passes known as the Southwest Pass, the South Pass (with two subdivisions near the Gulf), and an eastern arm dividing into North Pass and Pass à l'Ouvre.

These alluvial bottoms, however, do not entirely fill the space between the mouth of the Ohio and the Gulf. On the east bank there are high spots of solid ground, which were capes and peninsulas on the ancient ocean. Towns have been built on many of these high places—at Columbus (Ky.), Randolph and Memphis (Tenn.), Vicksburg and Natchez (Miss.), and Baton Rouge (La.).

#### Vast Drainage Basin of the Mississippi

The character of the Mississippi as a clear placid northern river does not change until the great Missouri pours its red-mud torrent into it just above St. Louis. In high water this stream has a volume greater than that of the Mississippi itself, and for miles the waters of the two rivers flow along side by side without mixing. A little farther on the Ohio

brings down from the Alleghenies a volume of water two-thirds as great as the other two combined. Altogether there are in the Mississippi system 250 tributaries and their branches, making 14,000 miles of navigable water and a drainage basin of 1,240,050 square miles.

The Mississippi varies greatly in width. At the mouth of the Illinois it is about 1,400 feet wide; below the mouth of the Missouri it widens to  $1\frac{1}{2}$  miles, but narrows again to about 3,000 feet in the lower valley. At New Orleans its depth varies from 30 feet in winter to a flood height of 62 feet. Its upper stretches are crossed by many bridges; below St. Louis there are few, including the great 4.4-mile railroad and highway span above New Orleans, completed in 1935 at a cost of 13 million dollars.

More than 750 islands large enough to be named or numbered dot the river from St. Paul to its southernmost tributary, the Red River. Around these the Mississippi twists and winds; in one stretch it flows 1,300 miles to cover a straight-line distance of 675 miles. It has a tendency to build up with silt the necks of land around which it flows, and at the same time to eat away the outer bank of each curve. These necks of land thus become longer and narrower, until the river breaks through to form a cut-off. The old channel remains as a crescent-shaped, or "ox-bow," lake, also called a bayou. Between the mouth of the Arkansas and Red rivers engineers have dug 12 artificial cut-offs, shortening the river 100 miles.

#### Annual Floods and Their Control

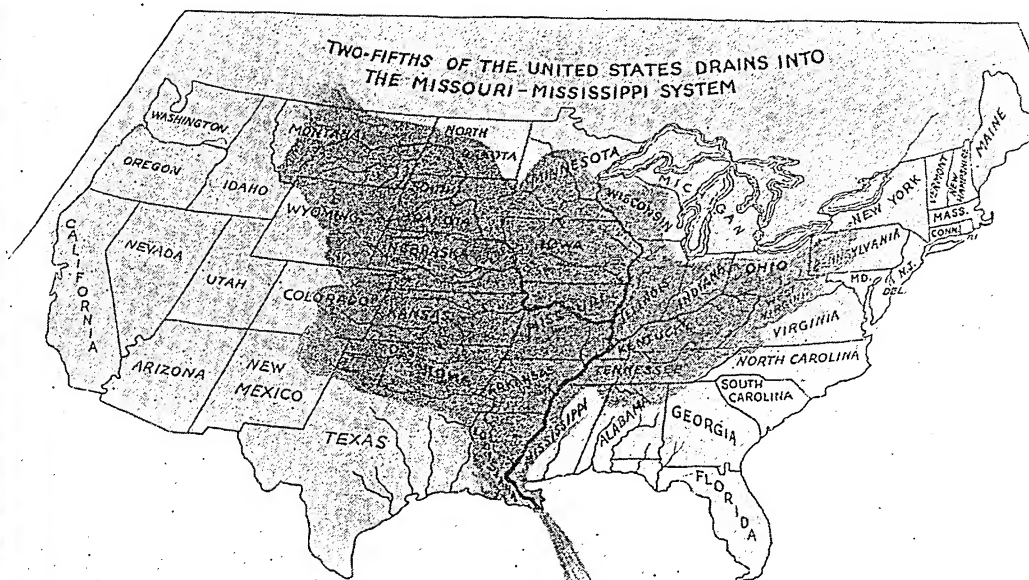
In the spring, melting snows from the Rockies and the Appalachians raise the water level along the lower river. The whole Mississippi basin is like a sponge, soaking up some of the rain waters but permitting the rest to run off. If the sponge is already saturated, all the rain runs off; and if this occurs at the same time as the spring thaws, floods occur, bringing destruction and tragedy.

New Orleans protected itself from flood more than two centuries ago with a dirt embankment a few feet high, called a levee. The next flood broke through. Since then, higher, stronger, and longer levees have been built, but each succeeding major flood has broken through the new levees as it had through the old. In 1926 engineers hoped that they had at last strait-jacketed the river. Yet in 1927 the worst flood in the river's history broke through in a dozen places, flooded an area the size of South Carolina, took 200 lives, drove 700,000 people from their homes, and destroyed property worth at least 275 million dollars.

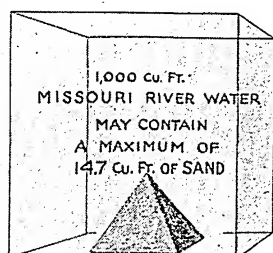
Since 1927, new methods have been used to control floods. Because a chain of levees is only as strong as its weakest link, levees of uniform strength and capacity have been built from Cairo to the Gulf. Their average height is 21 feet; the total system is 500 miles longer than the Great Wall of China and in places 25 times as thick. Built of earth, the new levees are surfaced with thickly sown Bermuda grass, and protected with concrete slabs called revetments

# WHY THE MISSISSIPPI IS THE "FATHER OF WATERS"

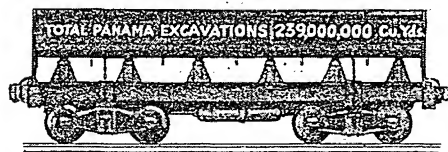
NORTH AMERICA	MISSOURI — MISSISSIPPI	4200 MILES
SOUTH AMERICA	AMAZON	4000 MILES
AFRICA	NILE	4000 MILES
ASIA	OB	2500 MILES
EUROPE	VOLGA	232.5 MILES



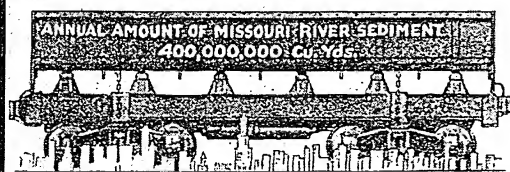
TWO-FIFTHS OF THE UNITED STATES DRAINS INTO THE MISSOURI — MISSISSIPPI SYSTEM



1,000 Cu. Ft.  
MISSOURI RIVER WATER  
MAY CONTAIN  
A MAXIMUM OF  
14.7 Cu. Ft. OF SAND

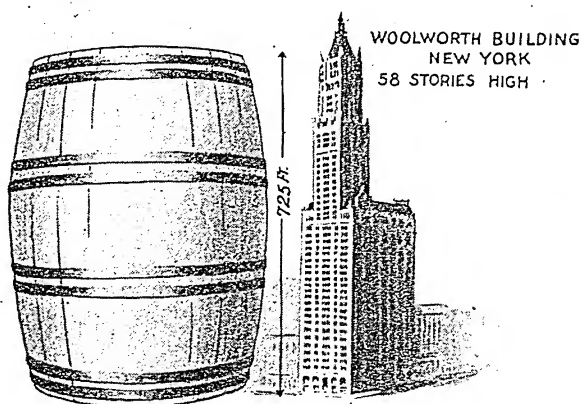


TOTAL PANAMA EXCAVATIONS 239,000,000 Cu. Yds.



ANNUAL AMOUNT OF MISSOURI RIVER SEDIMENT  
400,000,000 Cu. Yds.

RELATIVE SIZE OF CARS REQUIRED TO CARRY TOTAL PANAMA EXCAVATION AND ANNUAL MISSOURI RIVER SEDIMENT

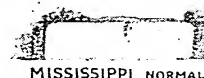


WOOLWORTH BUILDING  
NEW YORK  
58 STORIES HIGH

MISSISSIPPI'S MAXIMUM DISCHARGE  
EACH MINUTE WOULD FILL A BARREL  
OF 138,000,000 CUBIC-FOOT CAPACITY



NIAGARA



MISSISSIPPI NORMAL



MISSISSIPPI IN FLOOD EQUALS 8 NIAGARAS



and woven willow "mattresses." The total cost, paid chiefly by the Federal government, is enormous; yet it is no more than the cost of one great flood.

Spillways provide additional outlets through which flood waters can flow safely to the Gulf. By reducing the height of water in the main channel they relieve pressure on the levees. One spillway uses the Atchafalaya River in western Louisiana; another enters Lake Pontchartrain near Bonnet Carré, just above New Orleans. Many tributaries of the Mississippi have been dammed near their sources to make storage lakes. These hold some excess water in flood time and permit its release in dry seasons to help maintain the depth of water needed for navigation.

Another flood control measure is the restoration of the natural cover of forest and grass on land which has been laid bare by lumbering or on farms which are no longer productive. The natural vegetation and its roots act as a sponge to hold water from melted snow and heavy rains and to release it gradually through the year. (See also Floods.)

#### Erosion, Land Building, and Land Enrichment

Every year, and especially during the spring, the runoff of the water from the land carries away a tremendous tonnage of topsoil. Much of this material is carried as silt down the Mississippi and is deposited at the mouth. This helps to build a *delta* of new land outward into the Gulf of Mexico.

On the average, the Mississippi dumps into the ocean some 400 million tons of soil a year—enough to cover 3,240 square miles with a layer of silt one inch thick. This process started many ages ago when the river emptied into a long bay or arm of the ocean near Cairo, Ill. Today it has filled this bay to beyond New Orleans, and the alluvial or river-borne soil beneath that city is at least 700 feet thick.

Before man interfered, this constant transfer of soil from the uplands to the ocean was reduced somewhat by the annual floods. These deposited a thin layer of silt on the lands along the river's lower course and renewed their fertility. The Nile has kept Egypt fertile in this way for thousands of years. Along the Mississippi today the levees prevent this by delivering the flood waters to the sea.

This loss could be prevented by allowing the river to flood certain areas every year. But the cost would be tremendous. Communities would have to be built narrowly as "string towns" along the tops of levees and other high land. Farmers would have to live in town and travel to their farms, while all buildings needed on the farms would have to be high enough or strong enough to withstand damage from flood waters.

#### Early Boating on the River

From the earliest days until railroads were built in the western United States, the Mississippi and its branches carried most of the traffic through the vast river basin. At first the commerce was carried in flatboats ("broadhorns" and barges) and in keel boats. These craft carried pork, corn, flour, whiskey, hides, and staves to New Orleans. There the boats were sold

for lumber or reloaded with manufactured goods and poled or warped back upstream. The round trip often took nine months. (See also Pioneer Life.)

In 1811, four years after Fulton built the first successful steamboat, Nicholas Roosevelt built the steamboat *New Orleans* at Pittsburgh and took it to New Orleans, arriving in January 1812 after many delays; but it could not move satisfactorily against heavy currents. In 1815 Henry Shreve voyaged upstream with a shallow-draft boat, the *Enterprise*. Next year he built an improved vessel, the *Washington*, and took it from Pittsburgh to New Orleans, then back to Louisville. The *Washington* met all needs because it carried powerful, high-pressure boilers and engines on the deck of a shallow, barge-like hull. Thus it drew only a few feet of water, and strong currents caused only a slight drag to offset its power.

#### The Golden Days of River Traffic

Within a few years, vessels of this type swarmed on the Mississippi River and its tributaries. In January 1834, 230 steamboats and 4,000 flatboats were listed on the Mississippi alone. Transportation of coal on the Ohio, starting in the 1840's, became a great business. In 1853 St. Louis had 3,307 visits from steamboats, exclusive of the daily Alton packet.

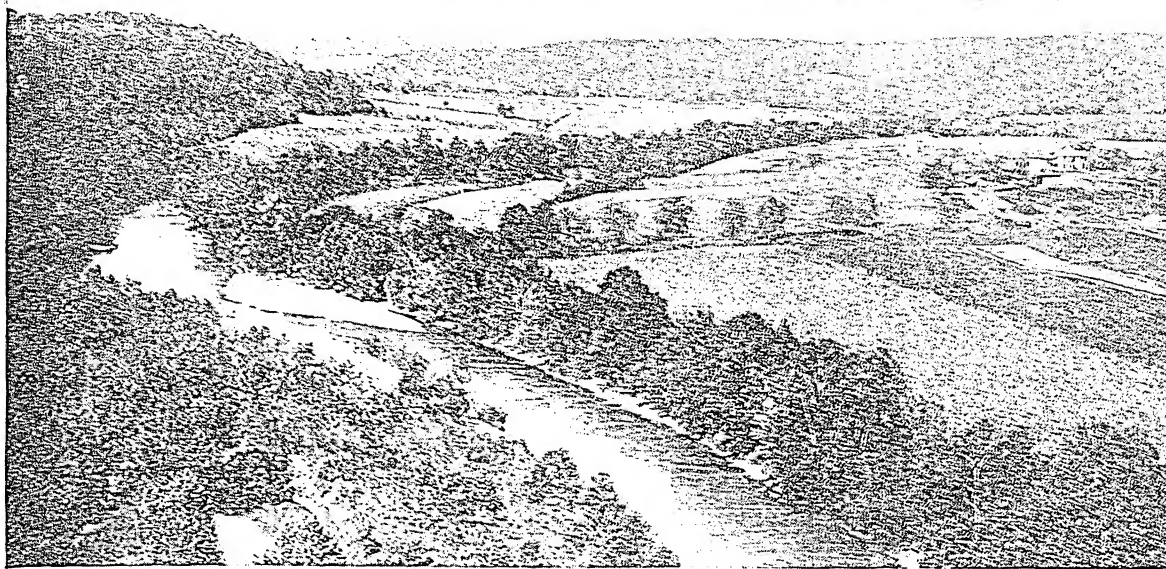
The cargoes included skins and lumber from the North, grain and meat from the central region, and coal from the Ohio. The South sent cotton, sugar, molasses, and miscellaneous freight. Along the banks cities grew rapidly, among them Minneapolis, St. Paul, Winona, Dubuque, Davenport, Rock Island, Burlington, Keokuk, Quincy, St. Louis, Cairo, Memphis, Baton Rouge, and New Orleans. The life of a steamboat man in those days was romantic and frequently beset with perils, as many boats were lost. Mark Twain spent part of his life as a pilot on the river during these great days and has written of it in his interesting book 'Life on the Mississippi.'

#### Decline and Revival of River Traffic

After the 1860's this prosperous period ended. The trend of settlement set strongly westward, and this took traffic from the north-south line of the Mississippi. Transcontinental railroads were built; and railroad efficiency, with its ability to serve industry far from any river bank, completed the ruin of Mississippi River steamboating.

During the first World War, the pendulum began to swing back. The railroads were unable to handle the enormously increased volume of traffic, and the government decided to build fleets of barges and towboats to meet the emergency. After the war the new service was placed in the hands of a government-controlled Inland Waterways Corporation. In order to provide a nine-foot depth of water in the Mississippi above the mouth of the Missouri, the government added a series of 24 dams and locks to supplement two older ones at Keokuk and Minneapolis. They were completed in 1940. These measures revived traffic, and even in 1931, before the dams were completed, the Mississippi was carrying the greatest tonnage in its history.

## MISSOURI'S FERTILE FARMS and METAL-VEINED HILLS



A Picturesque Valley among the Wooded Slopes of the Ozarks in Southern Missouri

**MISSOURI.** Missouri is one of the north central states of the Union, lying about halfway between the Atlantic Ocean and the Rocky Mountains, and between Canada and the Gulf of Mexico. It extends farther south than Virginia, yet is farther north than Kansas; and in the days of the Civil War this double connection with North and South was also noticeable. Missouri is especially favored in bordering upon the country's greatest river, the Mississippi, and being traversed for its entire width by the Mississippi's great tributary, the Missouri. With the many smaller streams that flow into them, Missouri has a navigable river system probably not surpassed in length by that of any other state. The Mississippi separates the state from Illinois, Kentucky, and Tennessee; and the Missouri, after forming part of the western boundary, turns east at Kansas City and flows through the heart of the state, joining the Mississippi about ten miles above St. Louis.

The landscape is widely varied. In the north and west are wide fertile prairies of rich alluvial soil, which merge on the west into the higher grassy pasture plains of Kansas. To the south the prairies give way to the rough densely forested slopes of the Ozark Mountains, which extend into southern Illinois, Oklahoma, and northern Arkansas.

*Extent.*—North to south, 279 miles; east to west, 304 miles. Area, 69,674 square miles. Population (1940 census), 3,784,664.

*Natural Features.*—Prairie plains in north and west, rising toward the west to an elevation of about 1,000 feet; forested Ozark Plateau in the south (highest point, Taum Sauk, 1,772 feet); and lowlands in the southeast. Chief rivers: Mississippi (eastern border) and Missouri, Osage and Gasconade flowing into the Missouri and Meramec into the Mississippi from the south; Platte, Grand, and Chariton flowing into the Missouri from the north. Mean annual temperature, 55°; mean annual precipitation, 40".

*Products.*—Corn, hay, wheat, oats, cotton, sorghum, potatoes, other vegetables, apples, peaches, small fruits, berries, pecans; cattle, dairy products, hogs, horses, mules, poultry; shoes, meat packing, clothing, flour and mill products, machinery, chemicals, iron and steel, lumber products, stone, clay, and glass products, railroad cars, lead, clay, cement, stone, coal, lime, zinc, barite.

*Cities.*—St. Louis (316,048), Kansas City (399,178), St. Joseph (75,711), Springfield (61,238); Joplin, University City, Jefferson City (capital), Hannibal, Sedalia (over 20,000).

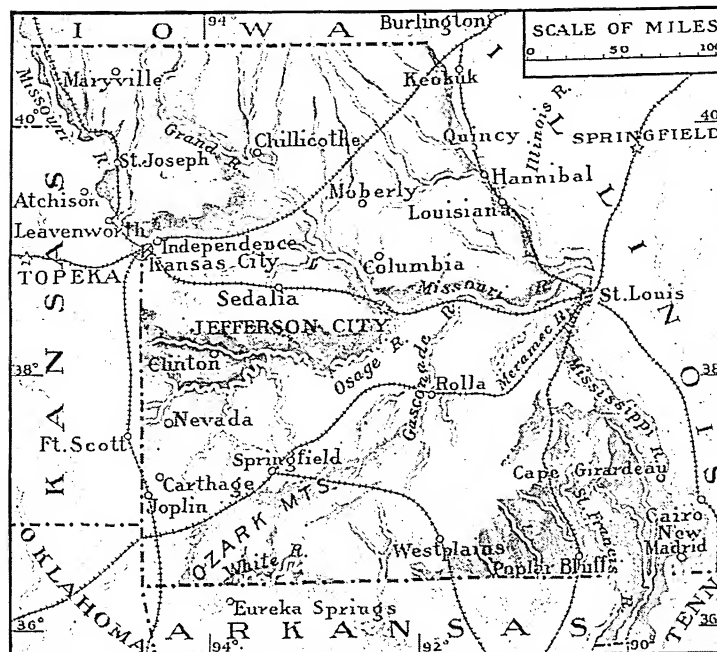
row valleys, where lie clear rapid streams and wonderful springs. There are a number of great caves, many miles long, like that described in 'Tom Sawyer', which contain hidden streams and great halls and galleries adorned with stalactites. There are also numerous groups of mineral springs, and these with the attractive scenery and healthful climate make some places in and near the Ozark region popular health resorts. Among the well-known mineral watering places are Excelsior Springs near Kansas City, and Sweet Springs near Sedalia.

In the southeastern part of the state are many miles of fertile bottomlands, swampy in the lowest portions but for the most part well drained.

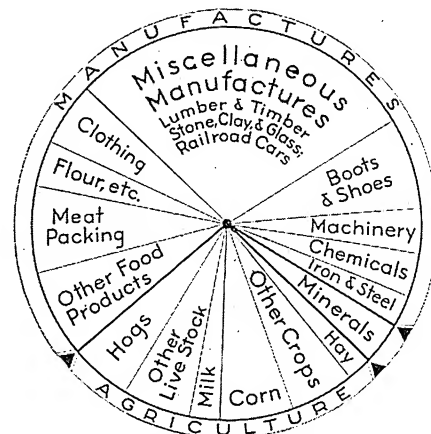
The climate varies between rather wide extremes, since the state lies in the center of the continent far from the oceans. While the Ozarks temper agreeably the summers in the southwest, they do not affect the climate of the state as a whole. The winters are generally mild, but the temperature sometimes falls

The Ozark Mountains are really the erosive remnants of a former plateau, into which many valleys have been cut by streams. The crests in Missouri range up to about 1,800 feet above sea level. These hills afford some of the most beautiful scenery of the Mississippi basin. Between great rock cliffs are deep narrow

## WHERE EAST MEETS WEST AND NORTH MEETS SOUTH



AGRICULTURE	MANUFACTURING	TRADE & TRANSPORTATION	OTHER OCCUPATIONS
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Missouri may be said to be the "cross-roads" state of the Union, lying midway between the Northern and Southern, the Eastern and Western States. Bordered by the Mississippi and crossed by the Missouri River, it is one of the best watered areas in the United States.

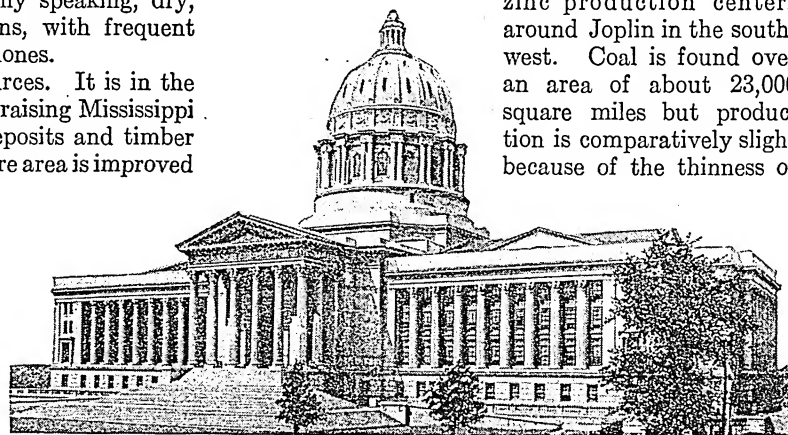
world famous for their superior quality, and few states of the Union raise more of these animals than Missouri does.

Most of the unimproved land is covered with forests of valuable timber, mostly hardwood, especially in the Ozark district. Missouri is one of the few central states that still market railroad ties, lumber, lath and shingles in large quantities.

Missouri is one of the world's most important sources of supply for lead, and for a time it led all the states in the production of zinc. The chief lead district is in the southeastern part of the state, while zinc production centers around Joplin in the southwest. Coal is found over an area of about 23,000 square miles but production is comparatively slight because of the thinness of

below zero and about once in every four or five years the Mississippi freezes partly as a result of floating ice from the north. The Missouri River is often covered with ice in the winter months. In the summers short periods of almost tropical heat are frequent. The climate is, generally speaking, dry, although there are abundant rains, with frequent thunder storms and occasional cyclones.

Missouri is rich in natural resources. It is in the heart of the agricultural and stock-raising Mississippi basin and has valuable mineral deposits and timber resources. More than half the entire area is improved land. Its rich soil places it among the leading ten states in the value of its diversified agricultural products. Nearly half of the crop acreage is devoted to corn. Other chief crops are wheat, hay, oats and other cereals, and potatoes. Apples and peaches grow in all parts of the state and many kinds of fruit can be cultivated successfully that cannot be grown farther north, such as apricots, tangerines, and varieties of grapes. In the southern part cotton, tobacco, and flax are raised. The raising of cattle and hogs is an important industry on the central plains, where clover and timothy flourish, and in the southern counties there are large sheep farms. The state's fine mules and blooded horses have long been

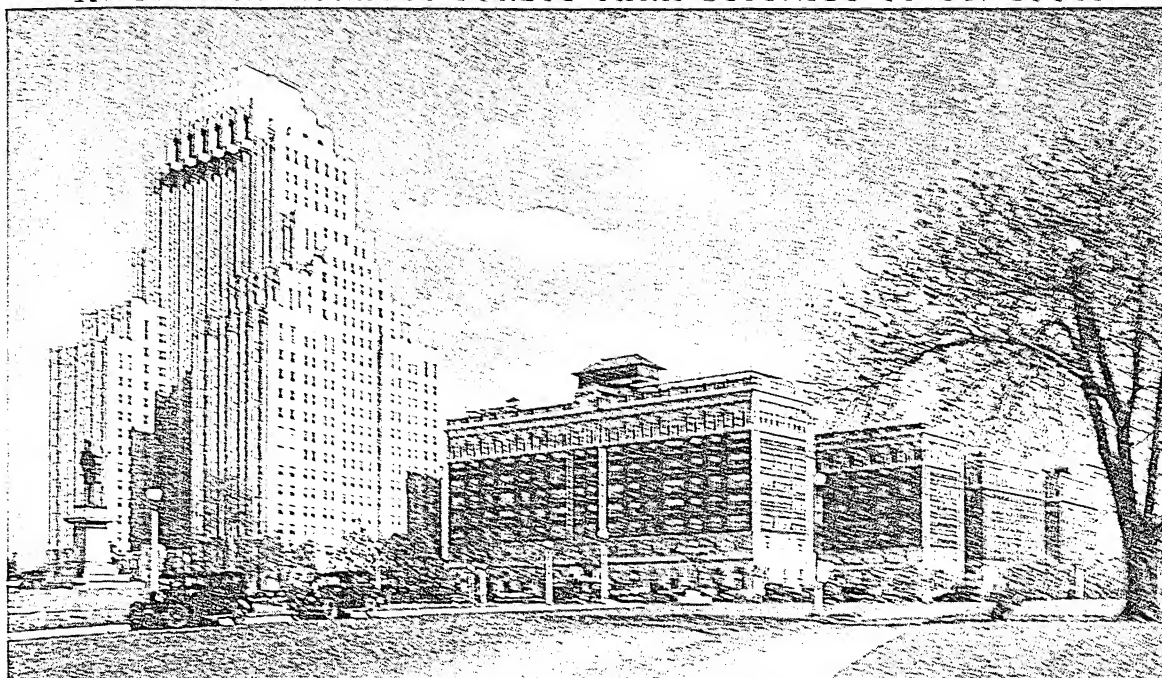


The Missouri State Capitol shown here is situated on a bluff overlooking the Missouri River at Jefferson City.

the seams. Iron ore is widely distributed in the Ozark region. Iron Mountain, about 80 miles south of St. Louis, is one of the largest known masses of iron ore in the world, but the output has long ceased to be significant. There are quarries of fine granite and limestone and extensive clay deposits suitable



## IN THE FASHIONABLE FOREST PARK DISTRICT OF ST. LOUIS



The magnificent example of modern "stepped-back" architecture in the left is the Park Plaza Hotel. Next to it is the Chase Hotel. Both of them front on the entrance to Forest Park, in the beautiful west end of Missouri's largest city.

for pottery making. Petroleum and natural gas occur in small quantities near the Kansas line.

Missouri also takes high rank as a manufacturing state because of its abundance of raw materials and its central location with good transportation facilities by rail and water. St. Louis is the industrial center (see St. Louis), but Kansas City, St. Joseph, and Joplin are also important centers (see Kansas City, Mo.). The leading industry is meat packing. In the manufacture of boots and shoes the state is surpassed only by Massachusetts and New York. The largest stockyards are in Kansas City, South St. Joseph, St. Louis, and Joplin. Joplin is the trade center of one of the richest zinc and lead regions in the world. It also produces mining machinery and supplies. Among other products of the state are cement, railroad cars and street-cars, flour and baking products, tobacco products, corn-cob pipes, foundry and machine shop work, pearl buttons, glass, and pottery. The state university is at Columbia, about 30 miles north of the capital.

#### Rail and Water Transportation

A network of railroads covers the northern and central part of the state, but there are a few counties in the southern tier without railroads. River transportation, neglected after the Civil War, has been revived. Cereals, cotton, and other products are shipped from St. Louis to New Orleans by boat. Recent immigration has not been large. Less than five per cent of the population is of foreign parentage. The Ozarks are populated almost exclusively by descendants of the mountaineers of Kentucky and

Tennessee. The first isolated and primitive lives until the discovery of mineral resources led to the development of this region.

#### Under Three Flags

Missouri, even when it was a wilderness had a highway—the Mississippi—which has always been Missouri's great "through street." The Spaniard De Soto turned west from the "Father of Waters" in 1541 at Cape Girardeau and crossed the present state of Missouri. In 1682 La Salle came down the river and included the country in "Louisiana" which he claimed for the king of France. In 1720 lead was discovered in eastern Missouri and Renault, a French pioneer, began to work lead mines with negro slaves in 1723. The first village was St. Genevieve on the Mississippi, where French settlers came in about 1735. The second settlement was St. Louis, begun in 1764, and to these two villages came about half of the French settlers of Illinois after the English conquest.

France transferred this whole region to Spain in 1762. By way of the Ohio, the Tennessee, and the Cumberland, people floated from Kentucky and Tennessee to find farms on the cheap lands of Missouri. Among them was the famous pioneer Daniel Boone (see Boone, Daniel). France got this whole country back in 1800 and sold it to the United States in 1803 (see Louisiana Purchase). To explore this new land, Lewis and Clark started up the Missouri from St. Louis in 1804 (see Lewis and Clark Expedition).

In 1812 earthquakes about New Madrid in the southeast opened great fissures in the earth and formed big lakes from portions of the Mississippi River.

When Missouri asked for admission to the Union in 1818, it precipitated a nation-wide controversy over the slavery question (*see Missouri Compromise*). Upon its admission as a state in 1821, the capital was established at St. Charles near St. Louis; after six years it was moved to Jefferson City. At first the entire western boundary was the meridian line which still forms the boundary south of Kansas City. In 1837 the "Platte Purchase," lying between that meridian and the Missouri River on the northwest, was added. Missouri in 1821 sent to Congress as its first senators David Barton and Thomas Hart Benton. The latter, a typical statesman of the Middle West, served in the Senate for 30 years (*see Benton, Thomas Hart*).

For many years St. Louis, then Independence, and lastly Kansas City were busy outfitting points for settlers moving westward. Hence Missouri was called "The Gateway to the West." (*See Far West.*) Missouri troops under Col. A. W. Doniphan marched overland to the Southwest and helped win the war with Mexico (1846-48). Before the Civil War progress was made, largely with state aid, in the building of the Missouri-Pacific and other railroads.

As a border state and a slave state, Missouri was soon dark with trouble. Opposing groups, some wanting slavery in Kansas and others wanting Kansas free, started bloody guerrilla warfare across the Kansas-Missouri border in 1855 (*see Kansas-Nebraska Act*). A convention called in 1861 to "carry the state out of the Union" surprised its promoters by refusing to do so. Francis Preston Blair, Jr., a strong anti-slavery leader, was largely responsible for the convention's action. When the governor, Claiborne F. Jackson, tried to seize the arsenal at St. Louis, his plans were defeated by Capt. Nathaniel Lyon and a force of Unionists. Missouri was saved to the Union, but the people were about equally divided in sentiment. The two factions clashed in battle in 1861 when Lyon defeated pro-slavery troops under Gen. Sterling Price,

a former governor. Jesse James turned guerrilla after his family had been mistreated by Unionists, and he later became a notorious outlaw.

The present constitution, which Missouri adopted in 1875, provides for the initiative and referendum, and includes strong laws controlling corporations.

"Mark Twain" (Samuel L. Clemens), the humorist, was a happy-go-lucky boy in Hannibal; and Eugene Field, the children's poet, was the most popular man in his class at the University of Missouri. The novelists Winston Churchill and Fannie Hurst, the poet Sara Teasdale, and Generals John J. Pershing and Enoch H. Crowder were born in Missouri. Champ Clark, long a leader of the Democratic party, represented Missouri in Congress for years. The great engineer James B. Eads did much of his work in St. Louis.

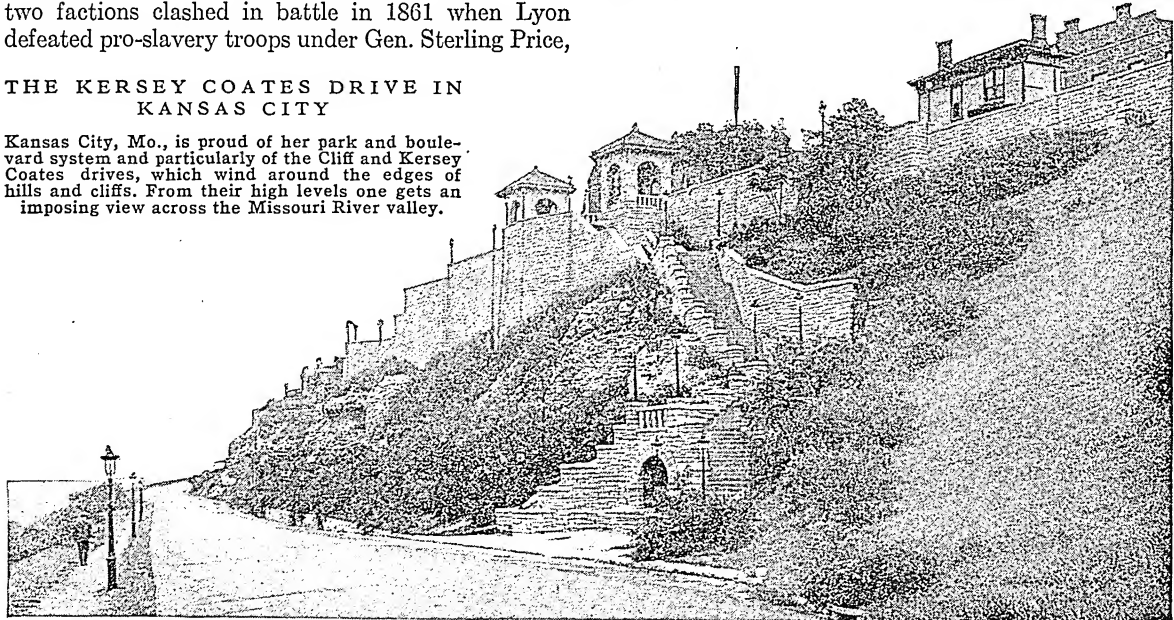
**MISSOURI COMPROMISE.** In February 1819 the people of the United States were suddenly awakened, as if by a "fire-bell in the night," to the existence of an acute issue between the North and the South on the slavery question. The awakening came with the introduction of a bill into the House of Representatives to admit Missouri Territory as a state. Since slavery was already lawful in this territory, presumably Missouri would wish to enter the Union as a slave state. But Representative James Tallmadge, Jr., of New York, moved that the bill be amended to provide that no more slaves should be brought into the new state, and that all children born of slave parents after its admission should be free at the age of 25.

Southern representatives expressed their alarm, while free state members were enthusiastic, although not unanimous, in approving of Tallmadge's plan. For three days the House excitedly debated the question, then passed the amendment by a vote of 87 to 76.

For many reasons this inevitable struggle over the expansion of slave territory had been slow to appear.

#### THE KERSEY COATES DRIVE IN KANSAS CITY

Kansas City, Mo., is proud of her park and boulevard system and particularly of the Cliff and Kersey Coates drives, which wind around the edges of hills and cliffs. From their high levels one gets an imposing view across the Missouri River valley.



The compromises of the Constitution on the subject had satisfied the slave states that the framers of that document intended no injustice against them. The importation of slaves was authorized until 1808; and Congress was required to provide for the return of slaves who escaped from one state to another. It chanced, also, that as far west as the Mississippi River a well-understood boundary line between slave states and free states had been established—in the East, “Mason and Dixon’s line” (*see* Mason and Dixon’s Line), and in the West the Ohio River (*see* Northwest Territory). Furthermore, in the admission of new states a balance had been kept between slave states and free states. There were then in the Union 11 of each; hence, in the United States Senate, where each state had two members, the Senators from slave and free states were equal in number.

This balance of power proved useful to the South, for the Senate rejected the Tallmadge amendment. Missouri, however, clamored for admission, and the future boundary between slave and free states in the Louisiana Purchase required definition.

#### Terms of the Compromise

By the time the next Congress met the materials were at hand out of which to make a compromise. Maine, with the consent of Massachusetts, from which it now asked to be separated, was seeking admission as a free state. Also, Senator Jesse B. Thomas of Illinois had proposed that, with the exception of the state of Missouri, new slave states should not be created out of territory included in the Louisiana Purchase north of 36° 30', the contemplated southern boundary of Missouri. At length both the House and the Senate agreed to permit Missouri to enter the Union as a slave state and Maine as a free state, and to accept for future guidance the dividing line that Senator Thomas had proposed (March 1820).

Some months later a supplementary Missouri Compromise had to be made. This was because the Missourians, who were for the most part strongly pro-slavery, had prepared a constitution which forbade the state legislature ever to pass a law emancipating slaves unless with the consent of their masters, and required the legislature to pass a law prohibiting the entrance of free colored persons into the state on any pretext whatever. The national House promptly voted against the admission of Missouri under this proposed constitution. Another compromise was arranged, however, mainly through the efforts of Henry Clay, by which Missouri was finally received into the Union on condition that her legislature would solemnly pledge itself never to ignore the rights of citizens of another state coming to Missouri (February 1821).

These compromises stilled the dispute temporarily, but after the Mexican War the addition of more territory to the west of the Louisiana Purchase revived the issue of slavery expansion. In 1854 the Kansas-Nebraska Act definitely repealed the provision that new slave states might not be created north of 36° 30'. (*See* Compromise of 1850; Kansas-Nebraska Act.)

**MISSOURI RIVER.** Had the Missouri River been discovered before the Mississippi there is but little doubt that the same name would have been applied to both streams, and the upper Mississippi—which is less than half the Missouri’s length—would have been considered merely a tributary of what is one of the longest rivers in the world. From its source among the Rocky Mountains in southwestern Montana to its conflux with the Mississippi just above St. Louis, the Missouri winds through a distance of 2,945 miles; while to the Gulf of Mexico the Missouri-Mississippi is 3,988 miles long.

Rising in the confluence of the Jefferson, Madison, and Gallatin rivers, the Missouri, or “Big Muddy”—an ugly tortuous stream—dashes almost due north through a beautiful mountainous region. Sixteen miles east of Helena, Montana, it flows through a narrow canyon or gorge, with walls 1,200 feet high, called the Gates of the Rocky Mountains, where the beauty and grandeur of the scenery is almost unequalled. Farther along, about 350 miles from its source, are the Great Falls of the Missouri, where the river descends over 400 feet in 12 miles, by a series of five cataracts the highest of which has a fall of 75 feet. Turning eastward and then southeast, the Missouri flows through North Dakota and South Dakota, forms part of the boundary between the latter state and Nebraska, then forms the boundary between Nebraska and Iowa, Nebraska and Missouri, and Kansas and Missouri as far as Kansas City. At that point it enters the state of Missouri and flows eastward until it reaches the Mississippi.

The Missouri is a rapid stream, noted for the irregularity of its course and for the huge deposits of silt it carries with it. It rushes along furiously, breaking down its banks and sweeping into its current portions of land, branches, and uprooted trees. In the lower part of its course it moves more slowly, as it crosses some of the most fertile plains in the United States. With its tributaries it drains an area of 528,000 square miles. In North Dakota it receives its largest tributary, the Yellowstone River. In South Dakota the Cheyenne, in Nebraska the Platte, and in Missouri the Kansas are the chief tributaries.

#### Improvement of Navigation

The importance of the river as the outlet of a great grain empire has revived in recent years. The snags and silt deposits which were permitted to clog its channel after the railroads were built have been cleared. Barge lines navigate the river from its mouth to Sioux City, Iowa, 760 miles upstream. Fort Peck Dam, in northeastern Montana, was built to improve navigation by storing the headwaters and releasing them during periods of low water. Completed in 1941, it was at that time the largest earth dam in the world (*see* Dam).

Marquette and Joliet were the first explorers to discover the mouth of the Missouri, as they came down the Mississippi in 1673. It was not until the next century, however, that fur traders made their



way through its turbid waters in canoes and primitive boats. In 1804-05, Captain Meriwether Lewis and William Clark, under orders from President Jefferson to explore the land west of the Mississippi, traveled the full length of the river, ascending it to its source and giving the first accurate accounts of its course. (See Lewis and Clark Expedition.) In 1819 the first steamboat was seen on the river, and in the middle of that century gold seekers bound for California found it their last link with civilization as they steamed up its waters to St. Joseph.

**MISTLETOE.** Do you know that this familiar Christmas decoration, with its waxen white berries and glossy evergreen leaves, never takes root in the ground, but is a parasite that grows from a "sucker root" on the trunks of other trees? It belongs to a genus of which there are about 20 species, all parasitic, distributed through the warmer parts of the Old World. Of these only the mistletoe proper (*Viscum album*) is a native of Europe. The American mistletoe (*Phoradendron flavescens*) grows from New Jersey southward and westward, and closely resembles the European in general appearance.

The mistletoe appears as a bushy growth with many forking branches, often four feet long. It has oval leaves and tiny yellow blossoms, followed by the little white berries that ripen after snow flies. It grows on both deciduous and evergreen trees. The poplar, willow, mountain ash, and maple are among its favorites. In England it grows in greatest abundance on the apple tree. It is rarely found on the oak. The birds eat the pulpy berries. Flying from tree to tree, they carry the seeds, which lodge in the bark and grow.

Because of its peculiar character the mistletoe played a prominent part in German and Norse mythology and it was with an arrow from its wood that the beautiful god Balder was slain (see Balder). The mistletoe was said to bring happiness, safety, and good fortune so long as it did not touch the ground. Perhaps this is the reason why today we always hang up our mistletoe in the window, or on the chandelier. The Celts held the plant in veneration, especially when found on the oak.

**MOBILE, ALA.** The second city of Alabama and its only seaport, "the City of Five Flags"—as Mobile is called—has had a long romantic history. It was founded in 1702 by the French at a point north of the present city, and was the capital of the French province of Louisiana until 1720. In 1763 it was ceded to the English, but in 1780 the Spanish captured it. In 1813, under the claim that Mobile was part of the Louisiana Territory sold by France to the United States in 1803, it was seized for the United States by Gen. James Wilkinson. During the Civil War it floated the Confederate flag almost to the end, for although Admiral Farragut captured the Confederate fleet and took the forts which guarded the entrance of Mobile Bay in August 1864, Mobile was not taken until April 1865.

Beautiful homes of Spanish, French, and pre-Civil War days make the city a great tourist resort. In early spring thousands come to make the 17-mile tour of its public and private gardens, known as the Azalea Trail. The wonderful Bellingrath Gardens, on a private estate, are open to the public. The azalea was first planted in Mobile in 1711 by Fifise Langlois, who brought the flower from his native Toulouse. At the height of its bloom Mobile presents a scene of spectacular beauty with millions of bushes in the greatest variety of color.

Mobile lies on a wide sandy plain which rises gradually from a low water front along the Mobile River to a range of hills to the west. The harbor in the mouth of the river and the channel through Mobile Bay to the Gulf of Mexico, 36 miles distant, have been widened and deepened to allow the passage of the largest ships. Imports include aluminum and manganese ores, bananas, and sugar. Lumber, cotton, iron, and steel are the leading exports.

Shipbuilding, a considerable industry since the World War of 1914-18, expanded rapidly with government contracts to meet the naval defense program inaugurated in 1940. Lumber, paper, refined petroleum, fertilizers, chemicals, and scores of other products are also important. There is an \$8,500,000 United States Army air depot. The Bankhead vehicular tunnel under the Mobile River shortens the approach to the city by seven miles. Population (1940 census), 78,720.

**MOCCASIN SNAKE.** Along the banks of streams or on the edges of swamps throughout the southern United States may be found the water moccasin, one of America's most poisonous snakes. Mostly it lies upon some old log or overhanging branch watching the water, and if some unfortunate fish or frog passes beneath its sentinel post, the moccasin drops upon it like a flash. If the victim escapes the first rush, the snake will pursue it with superior swiftness far beneath the surface, returning to land to swallow its meal.

The moccasin's body is thick and heavy, with a quickly tapering tail. In color, it is dark brown with obscure black marks on its sides and yellowish spots on throat and abdomen. While it will flee rapidly at the approach of man, if cornered it will fight savagely, striking out with wide open jaws and displaying the white gullet, which has given it the nickname "cotton-mouth." It is chiefly dangerous when it invades the flooded rice fields.

With the copperhead and the rattlesnake, the moccasin belongs to the "pit-viper" family of snakes (see Copperhead; Rattlesnake; Viper). Its young are born alive, usually eight to ten in number. Scientific name, *Ancistrodon piscivorus*.

**MOCKING-BIRD.** You have to "listen to the mocking-bird" if you visit the Gulf States between the months of February and August, for during that season he sings both day and night. What the nightingale is to Europe, the mocker is to the Southern states. On moonlight nights one singer will begin his serenade, soon others will join, until the lovely chorus has awakened the little day birds of field and orchard who lift their heads to listen, and, before again tucking them under their wings, add their own particular little song to the concert.

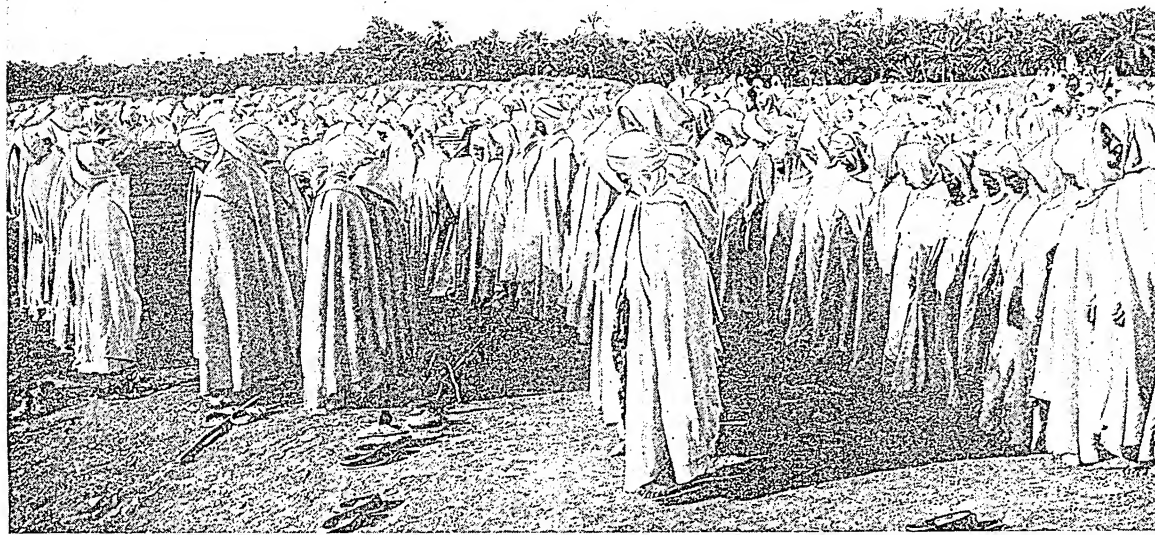
Besides his natural song, the mocking-bird imitates the notes of many other birds. This power he acquires by practice and he is a most exacting self-teacher—going over his lesson again and again, until he is able to deceive even an attentive listener. He thus imitates the cry of the night-hawk and even the barking of a dog and other unmusical sounds.

Mocking-birds have many endearing traits. They are most courageous and, in defense of their young, will attack dogs, cats, or even man. If kindly treated they become very trustful and will build in shrubbery about the very doorway of a house, perching sociably upon the window ledge or even venturing inside.

The nest is generally within 10 feet of the ground and is made of grass, sticks, or any convenient material. The four greenish-blue eggs are spotted with brown.

The bird itself, which belongs to the family of "mimic thrushes" (*Mimidae*), is about 10 inches long. The upper feathers are brownish-gray, and the under feathers lighter. The wings and tail are long and rounded (*see Birds for illustration in colors*). In the United States it is represented by two races. The eastern mocking-bird breeds in the southeastern states from the Gulf coast and Florida north to Iowa and Maryland. The western mocking-bird breeds in the southwestern states. Scientific name, *Mimus polyglottos*.

## The MOHAMMEDAN RELIGION and Its FOUNDER



Every good Mohammedan prays five times a day, with his face turned toward the sacred city of Mecca. These white-clad Arabs on the edge of the desert at Biskra in Algeria are in the first attitude of prayer, reciting: "There is no God but Allah, and Mohammed is his Prophet" (*la ilaha illa-lahu, Muhammad rasul allahi*).

### MOHAMMED (567-632) AND MOHAMMEDANISM.

Few romances are stranger than the career of this founder of one of the world's great historic religions. Born in Mecca of a good Arabian family, Mohammed (or Mahammed, also written Mahomet) was early left an orphan and was brought up by a poor but kind uncle. For a time he was a camel driver and accompanied caravans from Mecca to surrounding countries with which the Arabs had trade. And as he grew older he thought seriously upon all that he saw and heard, in the desert and in the cities, as he plied to and fro in the course of his calling.

The matter that caused deepest concern to the thoughtful young man was the ignorance and superstition of the Meccans and other Arabs, who were idolators. Marrying a rich widow named Khadija, he himself became a merchant, but he continued to brood on the low moral condition of his people. At this time the Jewish religion and Christianity flourished

in some communities of southern Arabia, and Mohammed could not help contrasting these clean religions with the idolatry of the Arabs. Mohammed became interested in the Bible and the books of the Jews, and grew familiar with the teachings and lives of Jesus Christ and the Prophets. He became convinced that there was but one true God, and not a mere multitude of magic-working spirits (like the *genii* of Aladdin's lamp) who dwelt in sticks and stones and graven images. So he began ridiculing the worship of the Meccans and preaching a new religion. He even claimed that the archangel Gabriel had appeared to him, revealing the true faith and commanding him to spread it abroad.

Mohammed soon gained the support of his own family and clan. From others came persecution so bitter that he was forced to flee from Mecca to the neighboring city of Medina. Many of his followers took refuge for a time with the Christian Abyssinians,

who dwelt on the African shores of the Red Sea. This flight or "hegira" of Mohammed (622 A.D.) is the date from which the whole Mohammedan world reckons time, as we do from the birth of Christ. It was also the turning point in Mohammed's career. He had proclaimed himself as the true interpreter of God, as a prophet, and fiercely denounced all idolators. At Medina the Jews were powerful, and, still having an admiration for their religion, Mohammed thought that he could combine with them in furthering his new worship. But the Jews refused his advances.

After winning a powerful position in Medina, Mohammed declared war against both the Jews and the Meccans. When the Arabs began to flock to his standard he proclaimed a savage crusade, which continued long after his death. Soon all Arabia was at his feet, for the desert Arabs rejoiced at the opportunity to plunder the rich Meccan caravans. Mohammed fiercely suppressed idolatry, and allowed no one to reside in his city of Medina unless he acknowledged the new faith. He boldly sent letters to all the known kings of Europe and Asia, calling upon them to acknowledge that "there is no God but Allah, and Mohammed is his Prophet." He died at Medina in 632, ten years after his flight. His tomb in Medina, as well as the sacred city of Mecca, are places of pilgrimage for all good Mohammedans. From poverty to rich empire, from obscurity to fanatical reverence as the Prophet and founder of a great new religion, is the romantic history of this camel boy of the Arabian desert.

Within a hundred years after Mohammed's death, not merely Arabia, but Syria, Persia, Egypt, northern Africa, and Spain had been conquered by Mohammed's victorious successors (called "califs"). His religion was prepared for yet further extension into Asia Minor, eastern Europe, central and eastern Asia,

and the interior of Africa. The spread of Roman conquest about the Mediterranean had taken more than four times as long. The progress of the Christian religion in its first century was hidden among the humble, and restricted to a much narrower area.

Today Mohammedanism (sometimes called

"Islam") is the faith of about 225,000,000 people in Asia, Africa, and eastern Europe. It ranks third in numbers among the great religions, only Christianity and the religion of the Chinese Confucius having more followers. Its sacred book is the Koran (see Koran), made up of discourses and sayings of the Prophet. Mohammed himself was illiterate, but his sayings were written down by his followers in Arabic, the sacred language studied by all Moslems (followers of Mohammed), who aim to know the Koran by heart. He borrowed largely from Christianity and Judaism, and Christ, Adam, Moses, and the angel Gabriel are mentioned with great reverence. Mohammedanism forbids the use of strong drink, or the lending of money at interest. Every Moslem must pray five times a day, facing toward Mecca. The *muezzins* or criers give the weird "call to prayer" from the tall minarets of the mosques or Mohammedan temples. One month in the year, called "Ramadan," is kept as

a season of fasting, when Moslems may not eat between dawn and sunset. The use of pork, as among the Jews and Hindus, is strictly forbidden. Mohammed himself married many wives in accordance with the oriental custom, his favorite wife being Ayesha. He adopted polygamy in his religion, but limited the number of wives for his followers to four. Mohammedans deny vigorously the common belief that, according to the Islamic faith, women are not regarded as having souls, or as sharing in any way in that Paradise which is promised after death to the faithful followers of the Prophet.

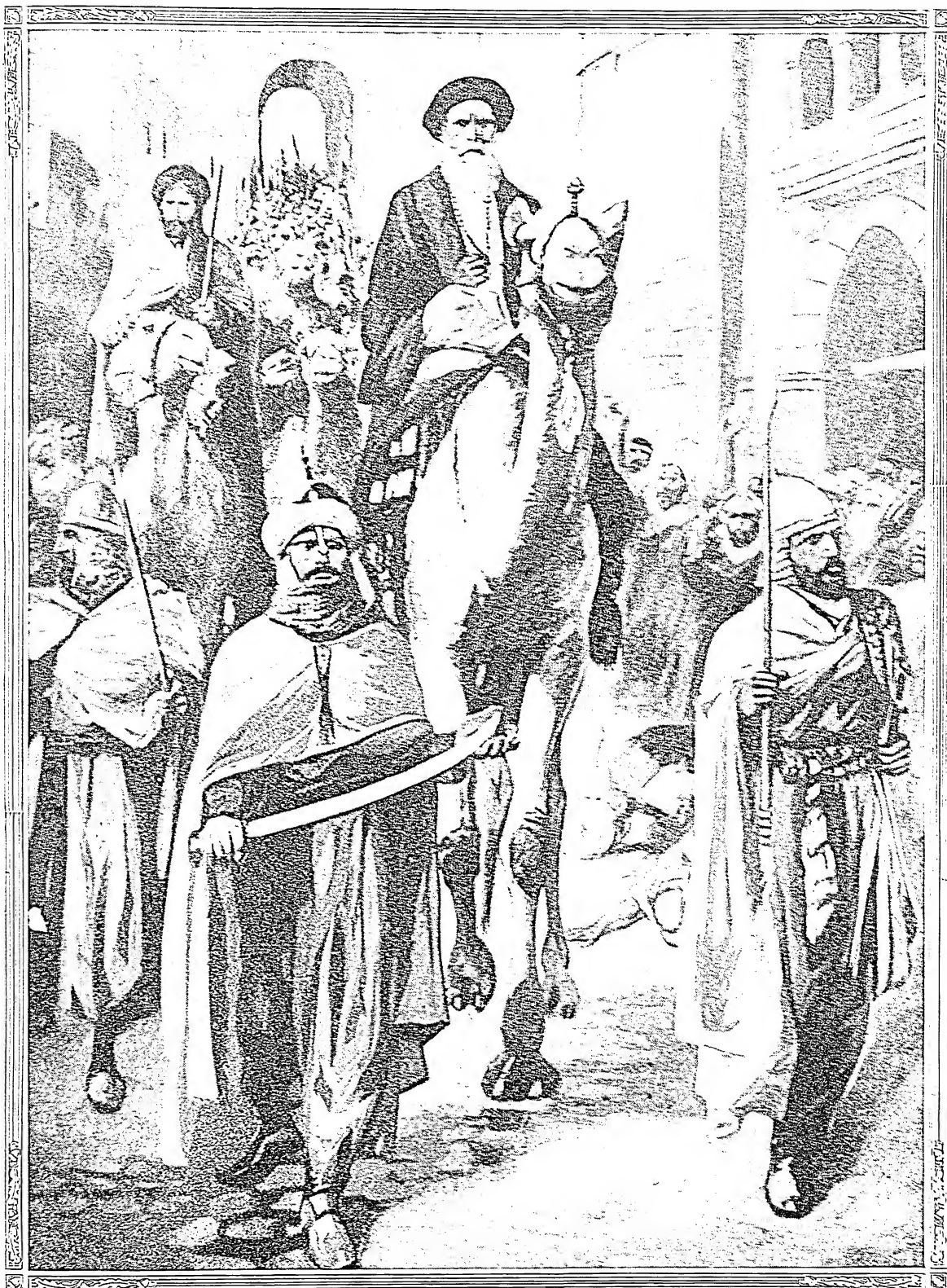
#### WHERE THE CALL TO PRAYER RINGS OUT



Three times a day from those high slender minarets of this Constantinople mosque there sounds out above the rattle of street cars and the chugging of automobiles the old Mohammedan call to prayer. The caller or Muezzin mounts in the morning to the first balcony, at noon to the second balcony, and at sunset to the uppermost balcony. No calls are issued for the afternoon and night prayers. The mosque shows the characteristic Byzantine succession of half domes and quarter domes rising higher and higher until they support the main one.



## MOHAMMED'S TRIUMPHANT RETURN TO MECCA



When his persecutors forced him to flee from Mecca, the city of his birth, Mohammed went to Medina, and there aroused fierce enthusiasm for the faith he preached. The Arabs flocked to his standard, and with their aid he soon overwhelmed the rich Meccans, returning as a conqueror to the city which he had left a hunted fugitive.

Like Christianity, Mohammedanism is divided into many sects. These, in turn, are split into smaller sects, each with its own special beliefs. Most of the Mohammedans are *Sunnites*, so called from their belief in the *Sunna* (way of life) dictated by califs who took up the Prophet's work after his death. Opposed to this orthodox sect are the *Shiites*, who hold that Ali, Mohammed's cousin and son-in-law, was his rightful successor (calif). The Shiites generally reject the *Sunna* because califs other than Ali and his descendants had a hand in its formation.

The calif was, in theory, both ruler and spiritual leader. The first, chosen in 632, was Abu Bekr, the Prophet's father-in-law. Ali, the fourth calif, on whom the Shiites base their sect, was the husband of Fatima, the Prophet's daughter. The califate continued for nearly 13 centuries, but steadily lost power. In 1924 the Turkish National Assembly abolished the office of calif, deposing Abdul-Medjid Effendi, former crown prince of Turkey (*see* Turkey). None of the present claimants of the title has general recognition.

#### Mohammedan Conquests and Culture

The "Saracens," as followers of Islam were called in the Middle Ages, passed from Africa into Spain in 711. At the battle of Tours in 732, exactly 100 years after Mohammed's death, the Mohammedan invasion of France was halted by Charles Martel, grandfather of Charlemagne. Driven back into Spain on the west, and held in check by the Byzantine Empire at Constantinople, the Arabs, Moors, and other Mohammedan peoples settled down in their new-won lands and developed a culture which far surpassed the contemporary culture of western Europe.

The centers of this culture were Damascus, in Syria; Baghdad, on the river Tigris; Cairo, on the lower Nile; and Cordova, in Spain. Here were gathered together the threads of civilization drawn from Greece, Persia, Syria, Egypt, India, and Spain. Agriculture made great strides. Irrigation was practiced extensively and tree-grafting became a science. Among new plants introduced into Europe from the Arabs—especially during the crusades—were rice, sugar cane, hemp, artichokes, asparagus, the mulberry, orange, lemon, and apricot.

In manufactures the Saracens excelled. The sword blades of Toledo and Damascus were world renowned. Equal skill was shown in the fashioning of vases, lamps, and like articles of copper, bronze, and silver; in the weaving of carpets and rugs which are still unsurpassed; in the molding of fine glass and pottery. Sweetmeats, syrups, essences, and perfumes were produced. Paper, without which the invention of printing would have been valueless, came to Europe through the Mohammedans. The finest leather goods came from Cordova and Morocco.

Arab caravans threaded their way into central Africa, and across the wilds of Asia to China and India to fetch the riches of these far-off lands, and Arab ships distributed them in the Mediterranean.

In literature, particularly poetry, and in science the Mohammedans attained a high degree of development. The University of Cairo at one time had 12,000 students. In Spain in the 10th century a library of 400,000 manuscripts is said to have been collected. Learned Arabs did much to preserve and spread broadcast the writings of the great Greek philosopher Aristotle, after he had been all but forgotten in western Europe. In mathematics Mohammedan scholars led the world. Algebra was practically their creation, though its elements were derived from the Greeks and the Hindus. The so-called "Arabic" numerals were introduced by them and replaced the clumsy Roman numerals. In astronomy they made notable advances. In chemistry many of our common terms, such as "elixir," "alcohol," "alkali," which are of Arabic origin, prove our indebtedness to these early students. In medicine their skill was in advance of European physicians, and they virtually laid the foundation of scientific pharmacy, many of their preparations being still in use. The richness and grace of their architecture is evident in all their lands, especially in Moorish Spain. Byzantine civilization alone was the equal of that so widely spread in the Mohammedan world.

All of this culture began to wane, however, when the Moslem world was split by the rise of the Turkish power in the 11th century. Great as was their early knowledge, the religion of the Moslems made the great mass of the people intolerant and unprogressive. Today the golden era of Mohammedan art and learning is but a memory.

**MOLE.** Destined to spend his whole life in darkness, digging, digging, digging, in order to build his home and to obtain the food necessary for his existence, a queer little creature, scarcely able to see or hear, and yet marvelously adapted for the part Nature has designed him to play in the world—the common mole is one of the most interesting of all animals.

You can always find the mole by the long ridge of cracked earth that zigzags across fields—the roof of his tunnel. It is lively work to dig him out, for he may be at either end, anywhere along the route, or in a side chamber. In your hand he lies helpless, a flat ball of fine, velvety, mouse-colored fur, about six inches long, with a naked, pink tail about an inch long. He has no neck; his ears are only little openings concealed in the fur; his dim eyes are tiny points covered with skin. If you put the sprawly wriggly creature on the ground, he scrambles about frantically until he finds a soft spot. Then he begins to dig with his strong spadelike fore feet and in less than one minute the animal has disappeared into a burrow in the ground. The swiftness with which a mole works is almost incredible; in a single night one has been known to tunnel more than 75 yards.

Moles are found both in the Old and the New World in the Northern Hemisphere. The common mole disfigures lawns, pastures, and gardens extensively by the ridges and furrows it makes hunting

food. It pays for some of the damage it does by eating quantities of cut-worms and other root-destroying larvae, insect pests, and occasionally even field mice, but its chief food is earthworms.

The mole ordinarily lives in a colony, in a complicated fortress. In little hillocks of earth, called

**MOLIÈRE** (*mō-lyâr'*) (JEAN-BAPTISTE POQUELIN) (1622-1673). What Shakespeare was to English literature, that the great comic dramatist Molière was to France. He is not so broad and deep as Shakespeare in his view of human life, nor so full of poetry and fancy; but no dramatist of modern times has

equaled him in the comedy of manners—that form of comedy in which one laughs at the fashions and foibles of his time. And Molière, though he portrays his own countrymen and his own age, belongs like Shakespeare to all lands and all ages; and now after nearly three centuries his plays still continue to delight great audiences, as they did in the days of his patron, “the Grand Monarch” Louis XIV.

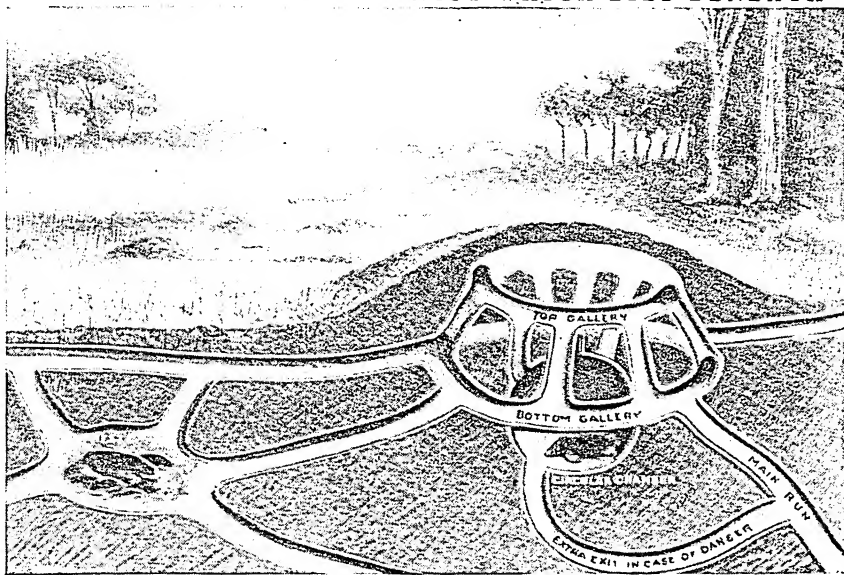
Jean Baptiste Poquelin—for that was his real name, and “Molière” only an assumed one—was born in Paris, the son of a prosperous furniture-maker who held the office of upholsterer to the king. Instead of following his father's calling, or taking up the practice of law, for which he had been educated, the young man chose

the uncertain life of a strolling player, and it was at that time that he took the stage name Molière. As an actor and theatrical manager, he learned the art of the stage, and gained that perfect mastery of dramatic structure for which his plays are noted. He also learned to know human nature and especially did he search out the weaknesses, the follies, the vanities and pretensions, the ludicrous traits in men and women. He usually emphasizes one outstanding characteristic. Harpagon in ‘L'Avare’ (The Miser) and the hypocrite ‘Tartuffe’ are immortal creations of his genius; and few characters have aroused the world's laughter as Monsieur Jourdain in ‘Le Bourgeois gentilhomme’.

Molière's last play was ‘Le Malade imaginaire’ (The Imaginary Invalid), and in this he himself played the leading part, that of Argan. Though the character was suffering only from an imaginary disease, the actor himself was really very ill. In the midst of the play he fell into a violent fit of coughing, and died a half hour after the performance. It was Molière's last jest.

Molière's chief works are: ‘Les précieuses ridicules’ (The Affected Ladies), 1659; ‘L'Ecole des maris’ (The School for Husbands), 1661; ‘L'Ecole des femmes’ (The School for Wives), 1662; ‘Le Mariage forcé’ (The Forced Marriage), 1664; ‘Tartuffe’, 1664; ‘Don Juan’, 1665; ‘L'Amour médecin’ (Love as a Physician), 1665; ‘Le Misanthrope’ (The Misan-

THE MOLEHILL AND THE NEST WHICH LIES BENEATH



This diagram indicates the complicated system of runways and chambers which you would find if you investigated the ridges and molehills that disfigure mole-infested lawns and meadows. Occasionally a field mouse invades such mole-tunnels, and is caught and eaten, although the mole is blind and little larger than its victim. Traps set across the main runways catch the moles without injuring their valuable pelts, which bring high prices in the fur markets. But the traps must be cleverly set, for, as the diagram shows, the mole has many emergency exits.

molehills, there is constructed a central chamber surrounded by two ringlike galleries, one above the other. These circular galleries are connected by vertical passages, and the upper one has five openings into the central cavity. From the lower gallery about nine alleys lead off in different directions toward the feeding-grounds.

The American species are all small, and have very soft silky fur, as have also their European cousins. The common mole ranges from southern Canada and the lowlands of the eastern United States southward to Florida.

The only other North American member of the *Insectivora*, or insect-eating order of animals to which the mole belongs is the shrew, a mouselike creature, with a long pointed snout. Unlike the mole, however, the shrew has well-developed eyes and ears, and its feet are formed for running and not for burrowing. The best-known species in North America are the short-tailed shrew or mole-shrew, a ravenous little animal, about four and a half inches long, with a tail measuring an inch; and the long-tailed shrew. The pigmy shrew is the smallest American mammal, its body being little more than an inch long.

Scientific name of common American mole, *Scalopus aquaticus*. American short-tailed shrew, *Blarina brevicauda*; long-tailed shrew, *Sorex personatus*.



thrope), 1666; 'Le Médecin malgré lui' (The Physician in Spite of Himself), 1666; 'L'Avare' (The Miser), 1668; 'Le Bourgeois gentilhomme' (The Tradesman Turned Gentleman), 1670; 'Les Fourberies de Scapin' (The Rogueries of Scapin), 1671; 'Les Femmes savantes' (The Learned Ladies), 1672; 'Le Malade imaginaire' (The Imaginary Invalid), 1673.

**MOLLUSKS.** The large group of animals called mollusks, or *mollusca*, have soft bodies which are never divided into rings or segments, as are the bodies of *crustacea* (crabs, lobsters, crawfishes, etc.) and some worms. Many forms of mollusks are provided with hard, limy, or "chitinous" shells, which are either carried on the outside or are partially or wholly enclosed by a sheet of shell-forming muscular tissue, called the "mantle." They live on land and in water, both fresh and salt. There are four principal groups or classes.

(1) *Cephalopods*.—The most highly organized of all mollusks are the Cephalopods, or "head-footed" mollusks, which are so called from the fact that the head is surrounded by a circle of eight or ten sucker-bearing tentacles. In some ways the cephalopods approach in intelligence and in complexity of structure the vertebrates, or animals with a backbone. They have often been the subject of poem and story, and the beauty of coloring in some forms is so striking as to merit the attention of the artist as well.

Cephalopods include the nautilus, the argonaut, the octopus, the cuttlefish, and the squid. The nautilus is the only member of the group now living which carries an external skeleton, or shell. But long before human history began—millions and millions of years ago—there were many shelled cephalopods in the sea, all of which except the nautilus became extinct. From their remains in the earth we know that these did not attain the size of the cephalopods now living, and since the nautilus with its shell has a brain less highly developed, and is less intelligent, than the cephalopods without a shell, we infer that the shell limits both bodily and mental growth. We conclude that the squid could not have become a giant of the seas if it had been confined within a shell, however beautiful this might be.

#### Advantage of Doing without a Skeleton!

All cephalopods which have survived and become large possess either a small internal skeleton, or no skeleton at all. In the squids the shell is embedded in the "mantle," and has become reduced to a flexible remnant called the "pen," from its resemblance to the feathered quill pens used in former times. The cuttlefish has a calcareous, or limelike, skeleton, which supplies the cuttlebone which we feed to our canaries. The shell of the beautiful *paper nautilus*, or argonaut, is not a skeleton shell at all, but a mere case used by the female for the protection of her eggs.

In all cephalopods the body is enveloped in a soft mantle. All possess a distinct head, and the circle of eight or ten sucker-bearing arms or tentacles which gives them their name. The tentacles correspond to the fore part of the "foot" in other mollusks. The mouth is in the middle of the disk formed by the

tentacles. The large unwinking eyes, resembling those of a fish, are placed one on either side of the head. Through a siphon, formed from the hind part of the "foot," water is sucked in and expelled. In this way the creature breathes, as does a fish, while the rapid expulsion of the water is the chief means of locomotion.

The shape of the body varies in the different forms. It is globelike in some, and conical, egg-shaped, or cylindrical in others. The brain is inclosed, in most forms, by a cranial cartilage which also incloses the organs of hearing and supports the eyes.

Most, but not all, cephalopods possess an ink-sac or gland which secretes a dark fluid called "sepia," which can be discharged through the siphon at will. This beclouds the water, under cover of which the creature may escape from its enemies. Cephalopods also have the ability to change their color instantly by means of cells in their skin containing pigments. They are thus enabled to assume the appearance of their surroundings, which aids them both in eluding their enemies and in approaching their prey.

#### The Oyster and His Hatchet-Footed Relations

(2) *Bivalves*.—This second group of mollusks is given its name because the shell is in two pieces. The animals in this group have a "foot" shaped like a stone ax, which serves as a burrowing organ, and from this they are sometimes called *Pelecypods* or "hatchet-footed" mollusks. This group includes the oyster, the clam, the mussel, and the scallop. In these animals the head is rudimentary in the adult, but present in the young. The organs are symmetrically placed in the body, which is inclosed by the two lobes of the "mantle" and in turn is covered by the two half-shells or "valves." They breathe by means of gills which lie under the mantle, one on either side.

The bivalves are a very important group of mollusks because they supply man with a large amount of food. Oysters, clams, and mussels are collected in enormous quantities in many parts of the world and used as a substitute for meat. The shells of freshwater mussels are manufactured into buttons. Pearls of fine quality have also been found in many kinds of mussels in all parts of the Mississippi valley, as well as in the oysters of the sea. Mussels are also of service as scavengers for they devour decaying organic substances in the lakes and streams which otherwise would pollute the water.

#### The "Stomach-Footed" Mollusks

(3) *Gastropods*.—These "stomach-footed" mollusks, which form the third group, are typified by the snail and the whelk. They have a distinct head which bears one or two pairs of sense organs—the tentacles, or "horns." The two eyes are placed on the tentacles. When there are two pairs of tentacles, the eyes are placed on the hinder pair. The "foot" forms a creeping disk, on top of which is a twisted hump, covered by the "mantle," and containing the digestive organs.

The animal usually is entirely covered by a shell that is attached to its body by a powerful muscle, which enables it to leave the shell and draw itself in

again at will. The form of the shell is determined by the hump. If this is twisted or coiled, the shell also is twisted. In some forms, as in the limpet, the shell is a simple cone. Many of the gastropods, like the periwinkle, close the mouth of the shell on retiring into it, with a trap-door. When the animal is extended full length, the trap-door lies on its back. Nearly all young gastropods have a trap-door before hatching from the eggs, but some discard it after they are hatched. In many forms, especially in land snails, enemies are kept out of the shell by numerous sharp teeth placed around the opening. The gastropods are

found throughout the world, and furnish more than half of the 65,000 known species of living mollusks.

(4) *Amphineura*.—A fourth group, called *Amphineura* because of the doubling of their nerve-cords, contains the chitons, which are mollusks with a "coat-of-mail" shell—that is, with a small shell formed only on the upper surface. In these species the body is usually oval, and there is no distinct head. The feet constitute the entire lower part of the body. (See also Clams and Mussels; Cuttlefish, Squid, and Octopus; Nautilus; Oysters; Scallop; Shell; Snails and Slugs.)

## MONEY: WHAT IT DOES *and* HOW IT IS MADE

*How This Great Invention Helps Out in the Business of Life—Our Yardstick of Value and Medium of Exchange—Monetary Problems of the Modern World—The New "Managed Currency" Systems*

**MONEY.** The invention of money was one of the most important steps in the progress of mankind. Money serves several purposes in our economic life. It is the yardstick by which we measure the values of goods and services. It is the medium by means of which we make nearly all our exchanges. It also serves as a convenient way to store up purchasing power for later use.

### Money as a Measuring Device

As a measuring device, money is almost indispensable in our economic society, with production organized as it now is. Let us take a few examples.

Suppose a certain family has an income of \$250 a month. It is spending \$75 for rent and dividing the balance among food, clothing, light, heat, savings, and miscellaneous expenses. At every turn it measures the cost of one desired article against another, and the cost of all desired articles against the total family income. The family often considers whether it should move into a better apartment at \$85 or \$90 a month and cut down other expenses. On one occasion it decided to spend \$100 for furniture. Many articles were desired, but most of all a radio and an Oriental rug. A shopping tour showed that the Oriental rug would take all of the \$100. But a satisfactory domestic rug could be bought for \$40, leaving enough to buy a radio and several of the other articles desired.

Such experiences illustrate the use of money as a *measuring device*. The family is able to compare the cost of shelter, a rug, a radio, and other articles because it can express these costs in terms of a common denominator—that is, a money unit. It can also compare its total wealth and its total monthly income with the costs of things that are desired, because all of these can be expressed in a common unit. That common unit is for us the dollar.

When we think of money in this way we are thinking of it as a *unit of measurement*. It is like a foot rule, or a yardstick, or a pound weight. While it would be possible to express the comparative lengths of two poles, or the relative values of radios and rugs, in

terms one of the other, it is far more convenient to use a standard measuring unit in terms of which each may be expressed.

Money calculations determine to a very considerable degree the kind and methods of work which go on in our economic system. A farmer, for example, is considering whether to plant corn or oats in a certain field. He estimates in money terms the probable return for each type of crop and the cost of growing each, and puts in the crop which he believes will yield the best money results. In the same way manufacturers calculate the cost of using machines as against workers for performing certain operations. They measure the money cost against the money returns.

Money measurements also help in carrying on borrowing activities (see Credit). A farmer in the corn belt, for example, believes that if he could buy 50 cattle in the fall, he could, after feeding them for a year, sell them at a net profit of 10 per cent. A banker is willing to lend him the money to buy the cattle on the agreement that the farmer will repay the money plus an additional amount. The banker calculates in money units how much additional payment he believes will compensate him for not using the money at the present time. The farmer calculates in money terms whether he can afford to pay what the banker demands. Practically all debts represent similar calculations.

It is not necessary for measuring purposes that the money unit in which the calculations are made shall be a coin. The gold dollar served for many years as our standard unit of value, though it was not a coin. Our gold dollar, until 1933, meant a quantity of gold of a certain weight (25.8 grains) and fineness (ninety-ninths gold and one-tenth copper alloy). What is necessary in using money for measuring purposes is that there be a definite concept of a unit of value.

### Money as a Medium of Exchange

Now for an illustration of a second use of money. Suppose I have a work horse which I no longer need. I desire a riding horse. I may search for a man who

has a riding horse and who wants a work horse of equal value. If I find him an exchange may be made. But it is far simpler to work through a medium—that is, to sell my horse for money and with the money buy a riding horse. Thus I may bring about the exchange even though the man who has the riding horse does not want a work horse, or if the two are of very different values. In other words, *by having some common medium which everyone will accept, trading or exchange is made easy*. When some type of article or commodity will be generally given in return for goods or services and will be generally accepted as payment for goods and services, that type of article or commodity is serving as money in the sense that money is a medium of exchange. A government may declare that a certain commodity, or representatives or *tokens* of it (such as nickels and pennies), shall be taken as payment for debts. A government thus makes the designated money *legal tender*.

Barter, which is direct trading without money, is supposed to have existed in many parts of the world before money was thought of. Even now barter has not completely disappeared. The price of many new automobiles is paid in part with old automobiles, and real estate deals are often in part "trade-ins." Such barter is nearly always preceded by an agreement as to the money value of the things to be traded.

To appreciate the importance of money as a medium of exchange, we must recall the extent to which we today carry on production by division of labor—*specialization*. Only a few people produce completed articles. Most of us contribute only some part of a specialized article or service. We have to exchange our specialized contributions, which often have no tangible form, for the many things we use. The values of these goods and services are measured through calculations made in money units. Without money, we could hardly have so high a degree of specialization, which is an extremely efficient way to produce goods.

#### Money as a Store of Value

There are several ways in which one can "store up" savings. One way is to buy durable goods, such as buildings or land. A second is to accumulate claims against the future income of others. This may be done by lending money to individuals, or by buying bonds or stocks of corporations, or by buying life insurance, or by putting money into a savings bank. A third way is merely to keep the savings in the form of money. Money thus used is said to be serving as a "store of value." The difference between this last way of saving—"hoarding," it is sometimes called—and other methods of storing up values, is that the money can be spent at any time. It is a claim, so to speak, against the products of the community in general, whereas purchases of securities, deposits in banks, and loans to individuals are claims against corporations or persons.

#### Types of Money

Primitive races have tried all sorts of commodities as money. Some of these commodities have been things having no intrinsic value except from their use

as money. Shells, beads, tobacco, furs, skins, hatchets, salt, rice, tea, dates, and ivory are among the types of money used by primitive peoples. Sparta used iron; many nations have used copper or brass. The early Romans, as have many other peoples, measured their wealth in cattle, and their word for "money" was *pecunia*, from *pecus* (meaning "oxen"). White and purple "wampum" beads, made of sea shells, were the money of the North American Indians, as cowry shells were of the natives of Africa and Hindustan (*see* Shell). The value of this shell money was due at first to its attractiveness as ornaments, but it was greatly increased by its usefulness as money. The Assembly of Virginia passed a law in the 17th century, declaring that tobacco could be used to pay taxes and that creditors must accept it when it was offered in payment of debts.

Metals, it was found, make the most satisfactory money. Silver or gold, or both, came to be used for large payments, and copper for smaller payments. In modern times, except in China and a few other places, copper has ceased to serve as "standard money," though it is widely used for "token" coins. These are coins which owe their value usually to the fact that the government will redeem them in standard money.

Gold and silver have many advantages over most commodities which have been used for money. They are easily recognizable, and can be cut or molded or hammered into ingots of convenient size. They do not deteriorate with age, and are not easily damaged or worn. Their value is high enough so that amounts suitable for ordinary transactions are easily handled. And finally they are more stable in value than are most commodities, because the demand for non-monetary uses is steady and the supply in existence is so large that it is not affected much by sudden changes in production. They are not perfect in this respect, however; they do undergo considerable and very annoying changes of value.

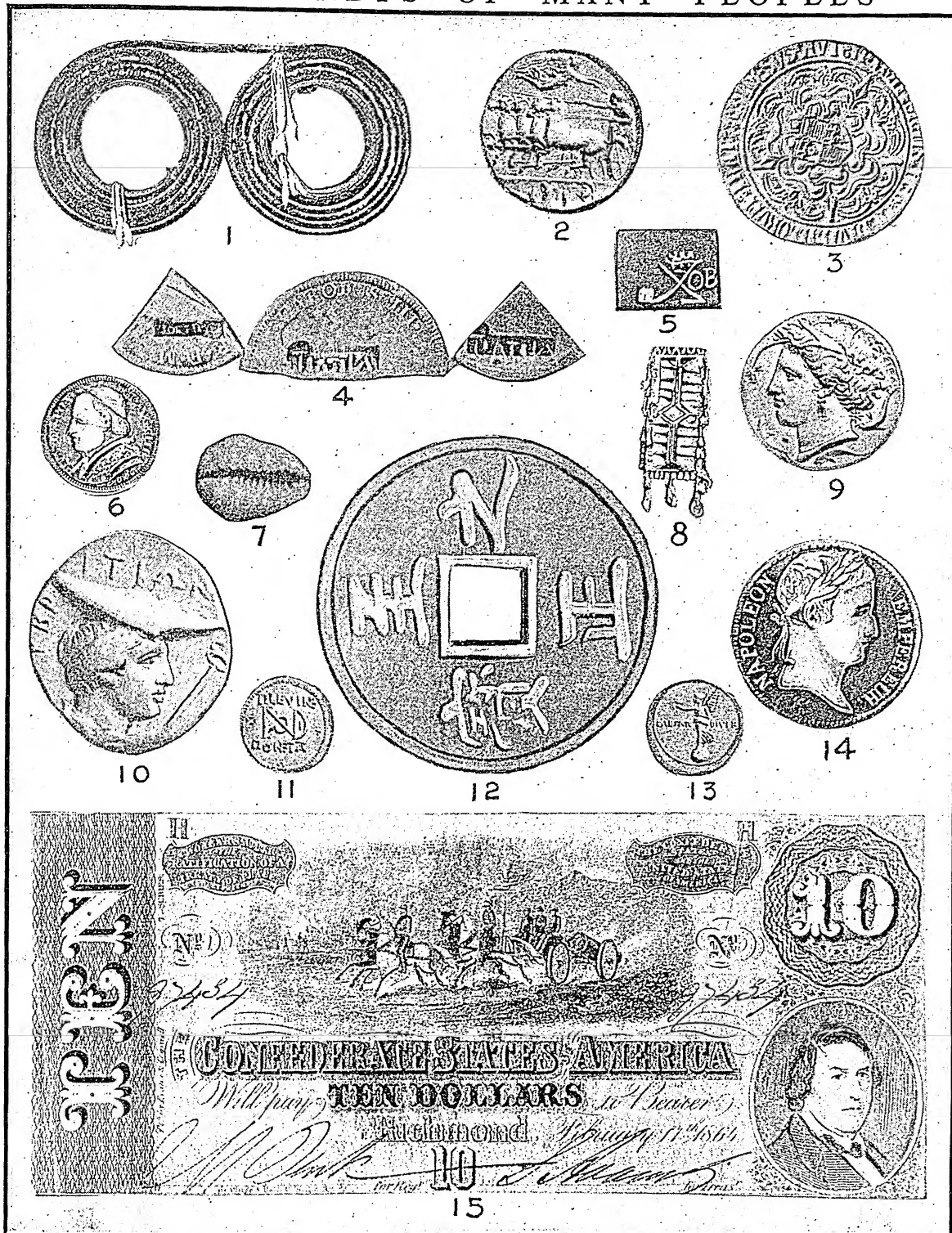
#### The Invention of Coinage

At first gold and silver passed by weight, as gold dust often does still in mining communities. Several of the common units of money were originally names of weights—as the Hebrew "shekel," and the Anglo-Saxon "mark," the later English "pound," the older French "livre," and so on. Indeed, coinage was originally merely a way of certifying to the weight and fineness of an ingot of precious metal, so that payments could be made by count. The earliest known coins were those of the Lydians in Asia Minor, dating from the 7th century B.C. China and India may have had coins even earlier. Even after coining began, the coins were often weighed, because dishonest people clipped or filed the coins to obtain the particles of gold or silver. It is to prevent such "theft" that modern gold and silver coins are made with raised and "milled" edges, which show plainly any clipping or filing.

After the invention of coinage, probably the most revolutionary step in the development of money sys-



# MANY MONEYS OF MANY PEOPLES



There are almost as many kinds of money as there are ways of spending it. Here are only a few examples from people widely separated in geography, time and degree of civilization: 1. Feather money of Santa Cruz (valuable feathers woven into this form for convenience in handling as articles of commerce). 2. Ancient Greek coin, City of Syracuse. 3. Gold sovereign of Henry VII. 4. Spanish coin, cut into halves and quarters for use as fractional currency by Peru. 5. Swedish square money, 17th century. 6. Lira issued by Pope Pius IX. 7. Cowry shell. 8. Wampum, used for ornamental purposes. 9. Coin of the City of Amphipolis (Greek). 10. Head of Hermes, God of Commerce, on the coin of Sybrita, a Cretan City. 11. Coin of Alfred the Great. 12. Chinese Cash. 13. Roman republican coin, Octavian (afterward Augustus). 14. Twenty franc "Napoleon" 1812. 15. Ten-dollar note of the Confederacy.

tems was the introduction of *credit currency* (see Credit). In the ancient world, and throughout the Middle Ages, money circulated on the basis of its metallic content, real or supposed. True, kings sometimes took advantage of their power and "debased" the currency by putting out new coins smaller than those issued in the past or by putting in more alloy; thereby they cheated their creditors when government debts were paid, and incidentally gave all other debtors something at the expense of their creditors. But in the early modern period it was discovered that a *promise* to pay money, if there was general confidence in the maker of the promise, would serve most of the purposes of real money. Goldsmiths, merchants, and money lenders began to issue notes—written promises to pay cash on demand—and found that, if they were scrupulous about redeeming these notes when demanded, very few people asked for redemption. This "credit currency," being in the form of paper, was more convenient and safer to handle than the gold for which it could be redeemed. It was also less expensive to transport and to store. The issuing of such bank-notes became one of the important activities of the banking business.

Another form of credit money is the *bank deposit*. The banker merely gives a receipt for money deposited, and allows his customers to transfer these deposits among themselves by instructing him to transfer amounts from one account to another (see Banks and Banking).

Governments, as well as bankers, issue paper promises to pay gold or silver on demand. Sometimes they have observed their obligations scrupulously, keeping large reserves of coin on hand for redeeming their notes, and never making the issuance of new paper a method of paying current expenses without taxation. Such governments are said to have "sound" money. Other governments have made a practise of issuing notes without having the gold or silver to back them, and without providing for the retirement of the notes. Such currencies fluctuate greatly in value and cause great risks to business men and losses to everyone.

#### What Inflation Means

Temporary issues of paper money which will soon be retired out of taxes have been used successfully by many countries. But frequently governments which use this method of financing find that their revenues never catch up with their expenses. The paper begins to go down in value as increasing amounts of it are offered in the market for goods; in other words, prices of most commodities rise. The rise in prices increases the expenses of the government and an increased issue of paper is required. Presently people get alarmed and try to spend their money more quickly than usual for fear it will lose more of its value. This puts prices still higher. So the situation grows worse and worse.

Such a situation is called *fiscal inflation*. Sometimes in the past the inflation has proceeded to great lengths. In American Revolutionary days the Con-

tinental Congress issued vast amounts of paper money, which depreciated so rapidly that the saying "not worth a Continental" was used to express the worthlessness of this money. Much the same thing happened after the Civil War. The government had issued great numbers of "greenbacks," not redeemable at their face value in gold. These notes declined in value until \$300 in paper money was worth only about \$100 in gold; and it was not until 1879, by the Resumption Act of 1875, that the government resumed "specie payments," that is, undertook to redeem greenbacks dollar for dollar with gold. After the first World War several countries passed through most amazing inflations; Austrian currency went to 1/70,000 of its pre-war gold value, Germany's to 1/1,000,000 of 1/1,000,000. Such practises result in the financial ruin of thousands of people who have wealth in the form of money or claims to money.

#### Bimetallism and "Free Silver"

In the 19th century various countries, of which the most important were the United States and France, had a system called *bimetallism*, under which gold and silver were both recognized as standard money at a fixed ratio of one to the other. In France for many years gold and silver were both standard money, 15½ ounces of silver being considered equivalent to one ounce of gold. In the United States the ratio was 15 to 1 down to 1834, then 16 to 1 down to 1873, when the silver dollar was dropped.

Bimetallism can work successfully only if the ratio of the value of the two metals in world markets stays very close to that fixed by law. If the market ratio is not the same as the money ratio, people tend to make all their money payments with the cheaper metal and withdraw the dearer one for non-monetary use or for export, just as where there is a single standard, they tend to pick out the heavier coin for melting and for export, and keep the lighter ones for circulation. This tendency of the cheaper money to drive out the dearer is known as "Gresham's law." In the United States the legal ratios were too far from the market ratio. The result was that down to 1834 the country was in effect on a silver standard, and since then it has been in effect on a gold standard, except for considerable periods when both gold and silver were supplanted by "credit currency," as in 1933 and the following years.

The coinage of silver has often been a stormy question in American politics. "Free silver" advocates want the free and unlimited coinage of silver, at a fixed ratio with gold, for anyone who brings the bullion to the mint. They argue that this policy would benefit the country by raising the price of silver, and by raising prices generally as the result of increasing the amount of currency.

#### Monetary Systems before the First World War

In the late years before the World War of 1914-1918 the money systems of the world fell into three principal groups: gold currencies, silver currencies, and irredeemable paper currencies.

The *gold standard* countries, which included all the leading commercial and industrial powers, used paper money and silver and copper and nickel coin alongside their gold coinage, but the paper and the minor currency (called *token coinage*) had the same purchasing power as gold, because it was possible for any one to get gold in exchange for these tokens, to use it freely for industrial purposes, to hoard it, or to send it out of the country. Since each money unit of the gold currency countries was redeemable in a fixed amount of gold, the currencies of all these countries were tied together in terms of value. The number of dollars which could be had for a pound or a franc or a lira varied only by a small amount, which represented at the most the cost of shipping gold in one or the other direction (see Foreign Exchange).

The *silver standard* countries, of which the most important were China and Persia, had similar systems. The relationship of their currencies to the gold currencies varied with changes in the market value of silver. Finally there were the countries with so-called irredeemable paper, or *fiat*, currencies. Austria and Italy were examples. In these conversion into a commodity was not provided. In practise, how-

ever, the currencies of these countries were redeemable at fixed rates for purpose of international payment, with the result that their values in terms of foreign gold currencies remained stable. (For a table of foreign monetary units, see Money in the FACT-INDEX.)

#### Some Postwar Changes

In the first World War all countries stopped gold payments and used paper currencies, but after the war the gold standard came back in the United States, in nearly all European countries, and in some others. The new gold standard differed from the pre-war standard, however, in several important respects:

1. Gold coin was no longer used (except to a small extent in the United States, in Switzerland, and in Holland).

2. Paper money was used in vastly increased amounts.

3. In certain important countries, England, for example, paper money was redeemed only in gold bars, of the value of about \$8,000, suitable for international shipments, but too large for convenient domestic use.

4. A considerable number of countries operated on the so-called "gold exchange standard." In such a country the note-issuing institutions have the option of redeeming their notes either in metallic gold or in written claims to the money of countries operating on a full gold standard. The advantage in this scheme was that a country which practised it could keep deposits in the banks of foreign cities and draw interest on them, instead of keeping large deposits of gold idle at home.

5. There was much more anxiety about currencies, and special agencies—central banks or treasury bureaus—were entrusted with the responsibility of "controlling" the currency by increasing or decreasing the amount according to the supposed needs of the country. (See also Federal Reserve System.)

#### Some Problems of the Value of Money

The value of any article expressed in terms of money is called its price. The value of money is not stated as a price, since

that would only be stating the value in terms of itself. The *price* of standard money, if we used the term, would never vary; but when its *value* goes up, the prices of other things fall; and when it loses value, other prices rise. As prices of different commodities do not move just alike, it is customary to measure the changes in the value of money by taking an average of the prices of a large number of commodities. Such an average is called an *index number*. A succession of such averages for different dates is called a series of index numbers. By looking at such a series one can see the changes in the value of money for that period.

There has been much dissatisfaction with the pre-war gold standard and still more with the post-war standard because of the instability of the value of money, as shown by index numbers. The dollar or pound or franc or other money unit is satisfactory

#### TYPES AND AMOUNTS OF MONEY IN CIRCULATION IN THE UNITED STATES

NOTE: The amount of money in circulation varies with fluctuations in business conditions. After the first World War the normal amount was about  $5\frac{1}{2}$  billion dollars. Increased expenditures during the second World War brought the amount to about 15 billion dollars. The table shows how this amount is divided among the different kinds of money, including issues still circulating but obsolete.

<b>1. METALLIC MONEY</b>	
Gold coin (no longer legally in circulation).....	doubtful
Silver dollars.....	\$ 74,000,000
Subsidiary silver coins.....	565,000,000
Minor coins.....	227,000,000
<b>2. PAPER MONEY</b>	
U. S. Notes (greenbacks).....	327,000,000
Promises of the United States to pay on demand, first issued in the Civil War; backed by a gold reserve of over 35 per cent, but gold cannot be demanded in payment	
Federal Reserve notes.....	11,667,000,000
Promises of the Federal Reserve banks to pay on demand; backed by commercial paper and a minimum gold reserve of 40 per cent, but gold cannot be demanded	
United States Treasury notes of 1890.....	1,000,000
A small remnant of an obsolete issue	
Gold certificates.....	58,000,000
Issued as certificates of ownership of gold held dollar for dollar in the Treasury for their redemption; possession now illegal, except as authorized by the government for bank reserves and foreign exchange	
Silver certificates.....	1,731,000,000
Like gold certificates, but legal for general circulation; usually acceptable as equivalent of "gold base" money; but, in the last resort, their value depends upon the value of silver	
National bank notes.....	136,000,000
Promises of the national banks to pay, backed by government bonds deposited with the Treasury; the Treasury called the bonds for redemption in 1935, taking over the obligation to pay, and retires these notes as received	
Federal Reserve bank notes.....	18,000,000
Like national bank notes, except issued by the Federal Reserve banks; being retired as rapidly as received	
<b>3. BANK DEPOSITS.....</b>	
extremely variable	
Represented by credits on the books of banks; payable in currency or by honoring checks	



enough for comparisons which do not involve time. But, when we want to compare the value of one thing as measured today with the value of another thing as measured last week or next year, our comparisons are colored by the fact that the value of the money unit itself changes. Changes in the value of money not only change arbitrarily the relations of debtors and creditors, but they bring about serious changes in the real incomes of people whose salaries or wages are fixed by law or custom so that they cannot readily be adjusted to new conditions.

Attempts have been made to work out a system of money which would be more stable than any of the standards used in the past. Among them is the suggestion of Prof. Irving Fisher, that the weight of the gold dollar should be increased when prices as shown by an index number are rising, and lowered when they are falling. Thus the value of the dollar (at least as shown by the index number), instead of its weight, might be kept steady. Others have urged that the same end be accomplished by changing the amount of bank credit which will be permitted to rest on a given amount of gold or other reserve money; or that interest rates be controlled so as to control the amount of bank credit indirectly. A system under which the value of the currency is controlled by these indirect methods, without any direct redemption in precious metal, is called a *managed currency* system. Specialists disagree as to the practicability of such systems.

#### America's "Managed Money" Experiment

In 1933 the United States embarked on a managed currency experiment; the government abandoned gold redemption and called in all the gold and gold certificates. Later in the year it began buying gold and silver at premiums above the former mint price of gold and above the market value of silver. In the summer of 1934 silver purchases were greatly expanded, but at the same time the currency was again tied to the gold standard currencies at 60 per cent of the former gold level, by methods very similar to those in use before the war, though no gold was released for domestic use.

The immediate purpose of the new currency system was to raise prices. This was considered desirable for three reasons: First, there was the belief that it would give relief to the debtor class, many of whom had borrowed money at a time when their services commanded a much higher price than they did later; second, it was hoped that the rising prices would stimulate greater business activity because they would give business men, at least temporarily, higher profits; and third, it was believed that a country with a depreciated currency could compete more effectively in foreign markets.

The basis for this last belief can be illustrated by the situation of an American manufacturer who sold, say, in the French market. If he would get the same number of francs for his product as he got in 1932, and could sell those francs for a larger number of dollars, he was in a better position to compete for the French market unless his wage bill and other costs

had risen proportionately. As wages particularly tend to rise more slowly than the prices of goods, selling abroad was, it was believed, likely to be more advantageous than before.

In a short time prices rose, profits increased, and the exchange value of the dollar fell, as had been expected. But this managed-money experiment was complicated by so many other factors that it is hard to estimate its success. With the political and economic upheavals which convulsed Europe for a decade and finally resulted in another great war, gold poured in from other countries until by 1940 the United States Treasury had more than 70 per cent of the world supply of monetary gold.

#### How Our Money Is "Made"

All United States money is coined or printed by the Treasury Department. Coins are minted by one of the mints (*see* Mint, United States). Paper money is printed by the Bureau of Engraving and Printing, at Washington. The original or master plates are engraved on steel. Since steel engraving is almost a lost art, the bureau has to train its own engravers. Each man specializes on one part of the process. Some engrave only the pictures or portraits (which are never of living persons); others do the lettering; and still others engrave the intricate borders. (*See* Engraving.)

When the plate has been engraved, it is hardened, and electrotype plates are made from it for printing. (*See* Electrotyping.) These plates are coated with a thin deposit of chromium, one of the hardest known metals, which gives a very sharp impression and lasts much longer than the hardest steel.

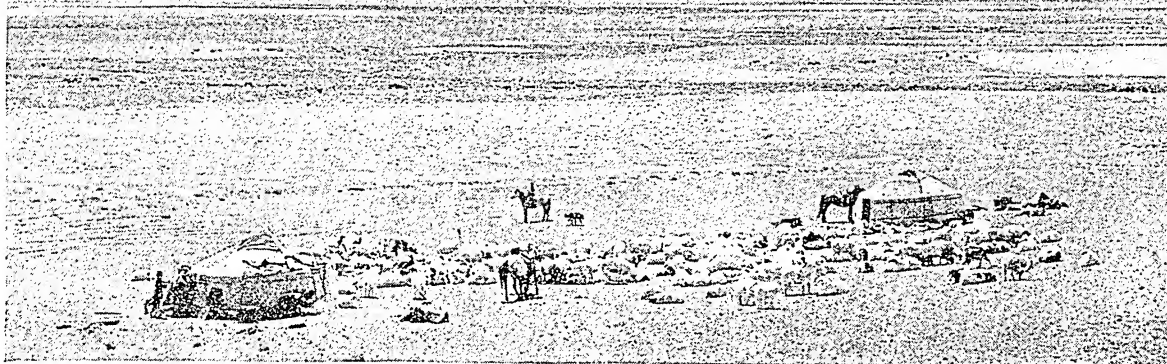
The paper on which the notes are printed is specially made at Dalton, Mass. It is made of a mixture of linen and cotton. Embedded in it are colored fibers of silk, nylon, or other synthetic material. Some of the fibers can usually be seen in a bill when held to the light. From 1861 to 1928, United States currency was of the uniform size of  $7\frac{7}{8}$  by  $3\frac{1}{8}$  inches. In 1928 the size was reduced to  $6\frac{5}{8}$  by  $2\frac{1}{8}$  inches.

Every year the government "money factory" has to print more than 1,000,000,000 bills—enough to make a 50-car trainload. The average life of a bill is only about a year (less for dollar bills); so four or five tons of worn and dirty bills come back to the Treasury for redemption every day. When they have been canceled, they are destroyed in a machine called a "macerator," which chews up a million dollars at a mouthful. Some of the pulp is sold and used in making pressed paper articles. The rest is burned.

If you tear, burn, or otherwise damage paper currency, you can redeem it at its face value if three-fifths of the note can be sent to the Treasury, and at half its value if less than three-fifths but more than two-fifths is returned.

The seal on United States paper money, bearing in abbreviated form the words *Thesauri Americani Septentrionalis Sigillum*, or "Seal of the Treasury of North America," is a relic of the days when it was hoped that Canada would join the United States. One-dollar bills issued since 1935 also bear the two sides of the Great Seal of the United States.

## The GRASSY Cradle of the MONGOLS



This typical Mongolian village lies on the edge of a meadowland watered by streams from the mountains in the distance. Gathered about the *yurts*, or movable homes, are the flocks of sheep and goats which provide the Mongolian nomad with his living. They furnish his food—mutton, milk, cheese, and butter—his clothing, and the covering for his shelter.

**M**ONGO'LIA. High amid encircling mountains in the heart of Asia lies one of the oldest and least known lands on earth. Over its cold, dry, wind-swept plains the Mongols, mounted on tough ponies, still range with their flocks and herds, as they did centuries ago in the days before they became the terror of the civilized world. But now the tables are turned. Bleak Mongolia's strategic position has made it a factor in the ambitions of Russia and Japan, for it lies between Siberia on the northwest and north, Manchukuo on the east, and China and Chinese Turkestan on the south and southwest. Its more fertile lands to the south have drawn swarms of peasant settlers from China. Caught in the grip of those rivalries, Mongolia has in recent times experienced terror and slaughter such as the Mongols themselves visited upon Asia and eastern Europe in the 13th century. (See Mongols.)

Geographically, Mongolia is a somewhat flat upland encircled by mountains and highlands. It has never been surveyed accurately, and no census of its population has ever been taken; but the estimated area is somewhat more than a million square miles, or as much as all that part of the United States east of the Mississippi River, with Minnesota, Iowa, and Missouri added. Yet the entire population is estimated to be scarcely more than 7,000,000, or less than that of the state

*Extent.*—Estimated area of all Mongolia, more than 1,000,000 square miles. Area of the Mongolian People's Republic (Outer Mongolia), about 626,000 square miles; estimated population, about 2,000,000, mostly Mongols. Area of the Republic of Tannu-Tuva, about 64,000 square miles; estimated population, about 65,000, of whom about 50,000 are Tuvians. Area of Inner Mongolia (Chahar, Suiyuan, and Ningsia), about 326,000 square miles; estimated population, about 5,000,000, mostly Chinese.

*Physical Features.*—Mountains: Altai, Tannu Ola, Sayan, Kentei, Great Khingans, Ala Shan, Nan Shan. Rivers: Yenisei, Selenga, and Orkhon in Outer Mongolia, Hwang Ho in Inner Mongolia. Many salt or brackish lakes. The Gobi (Shamo), a rock-floored basin about 1,000 miles east to west, 600 miles north to south.

*Products.*—Wool, hides, furs, meats, horses and other live stock; from Inner Mongolian farming lands, oats, wheat, buckwheat, millet, kaoliang, soy beans.

*Principal Cities.*—Ulan Bator Khoto (formerly Urga), capital of Mongolian People's Republic; Kysylchoto or Krasny, capital of Tannu-Tuva; Kalgan, Inner Mongolia.

of Pennsylvania alone.

The rock floor of the Mongolian basin is, on the average, about 4,000 feet above sea level. Its climate is cold, harsh, and changeable, and also dry, because the surrounding mountains wring most of the moisture out of the winds. The main basin is plentifully ridged with

chains of hills and low mountains. It is seamed with rivers, more plentifully in the northwest than elsewhere. Many of the rivers empty into salt or brackish lakes without outlet. Along the ancient caravan routes across the Mongolian plateau are wells, some dug hundreds of years ago. Without these wells, travel would be impossible.

### Transportation and Communication

Russia and Japan are interested in this vast region largely because railroads might be built across it to connect with the Trans-Siberian, the Trans-Sib, and the Manchurian lines. Ulan Bator (Urga), the capital of Outer Mongolia, has airplane service to the Soviet Union, and radio and telegraph service. Elsewhere the mail is carried by horsemen; relays of horses are kept at post stations for their use. Trade goods are transported mostly by pack animals or in heavy carts drawn by bullocks or camels. Automobiles can be used, even without roads, over great stretches of the flat, dry country; at times a motor service has been maintained in summer between Ulan Bator and

Kalgan, the starting point for caravans on the border between China and Inner Mongolia. But automobiles must remain few until gasoline becomes cheaper.

#### Political and Natural Divisions

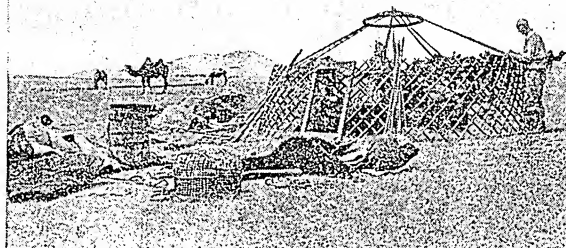
Its natural features divide Mongolia into three parts—northwestern or Outer Mongolia, south-eastern or Inner Mongolia, and the Gobi between. All Mongolia was, at least nominally, a part of China until recent years. But now the Mongolian People's Republic, a new semi-independent state dominated by Russia, occupies most of Outer Mongolia. The northwestern corner of Outer Mongolia was nipped off to make the republic of Tannu-Tuva, which is also a semi-independent state under Russian control; and a large slice from its eastern end was added to Manchukuo. Inner Mongolia has likewise lost its eastern province, Jehol, to Manchukuo, and the political status of the remainder (composed of the provinces of Chahar, Suiyuan, and Ningsia) is at present confused and uncertain, though it is still nominally Chinese. The boundary between the Mongolian People's Republic and the Inner Mongolian provinces runs an ill-defined course through the Gobi.

Outer Mongolia is like Siberia in its forested mountains to the northwest, its broad rich grassy steppes or prairies to the east, and its climate, with extreme differences between summer and winter. Inner Mongolia, separated from North China and from the Gobi respectively by mountain chains, is more like China in its grassy plains interspersed with desert and poor steppe land. It shares with China the southeastern summer monsoons. In some places these bring enough rain for farming.

The broad shallow basin of the Gobi is poor steppe land rather than true desert; in fact, *gobi* is the Mongol name for any broad expanse of nearly flat country. Thinly covered with gravel and sand, scoured by high winds, seldom visited by rains, it yet nourishes a scanty growth of wiry grass, thorny bushes, and low sagebrush. This poor fare supports gazelles, wild

asses, and many other wild creatures, as well as the camels and other domestic animals of the Mongols. Hundreds of miles apart stand a few stunted trees, two centuries or more old. They evidently started to grow when the land had more moisture than it does at present, for no young trees or saplings exist.

#### MOVING DAY AMONG THE NOMADS



Frequent moving days make the Mongol an expert at taking down or setting up his dwelling. Here we see a man attaching the sticks for the sides of the conical roof, while his wife holds the top piece in place with the center pole. Strips of felt over sides and top will complete the yurt, and the whole task takes only a half hour. The basket in the foreground is used for argul, the Mongol's only fuel. Beyond the basket is a water cask.

Fierce winds seem to blow forever here, with now and then a twisting "wind-devil" that covers everything with dust and sand. The heat of the summer sun smites through the dry air to make the bare rock almost blistering hot. Through the same dry air in winter the heat of the land radiates and is lost, and temperatures may fall to  $-40^{\circ}\text{F}$ .

The Gobi, poor and bare as it seems, is rich in relics of past land life. That is because through most of geologic time, the region has escaped being covered by the sea, and land plants and animals have flourished continuously. Here even now are more wild animals than may be found in the northern forests. Here scientific expeditions under Roy Chapman Andrews found relics of the mysterious Dune-Dwellers, an ancient people who lived long before the dawn of history; the bones of a baluchitherium, hugest of known mammals; dinosaur eggs, and seven skulls of a rat-sized creature, the oldest known true placental mammal (see Exploration).

In the Gobi and in the less fertile parts of Inner Mongolia, the Mongols live a nomadic life. Finding water is the Mongol's greatest problem. He seldom uses precious water to wash his body or his clothes; he licks his dishes clean with his tongue. As water and pasture fail in one locality, he must move his herds elsewhere; so

he uses a movable dwelling, and makes his utensils of wood instead of breakable earthenware. The rainfall of between 8 and 12 inches a year supports steppe grass, but agriculture is impossible over most of the country. This suits the Mongol perfectly, for he despises a farmer's life, and likes to wander with his herds. From their herds the Mongols get almost everything

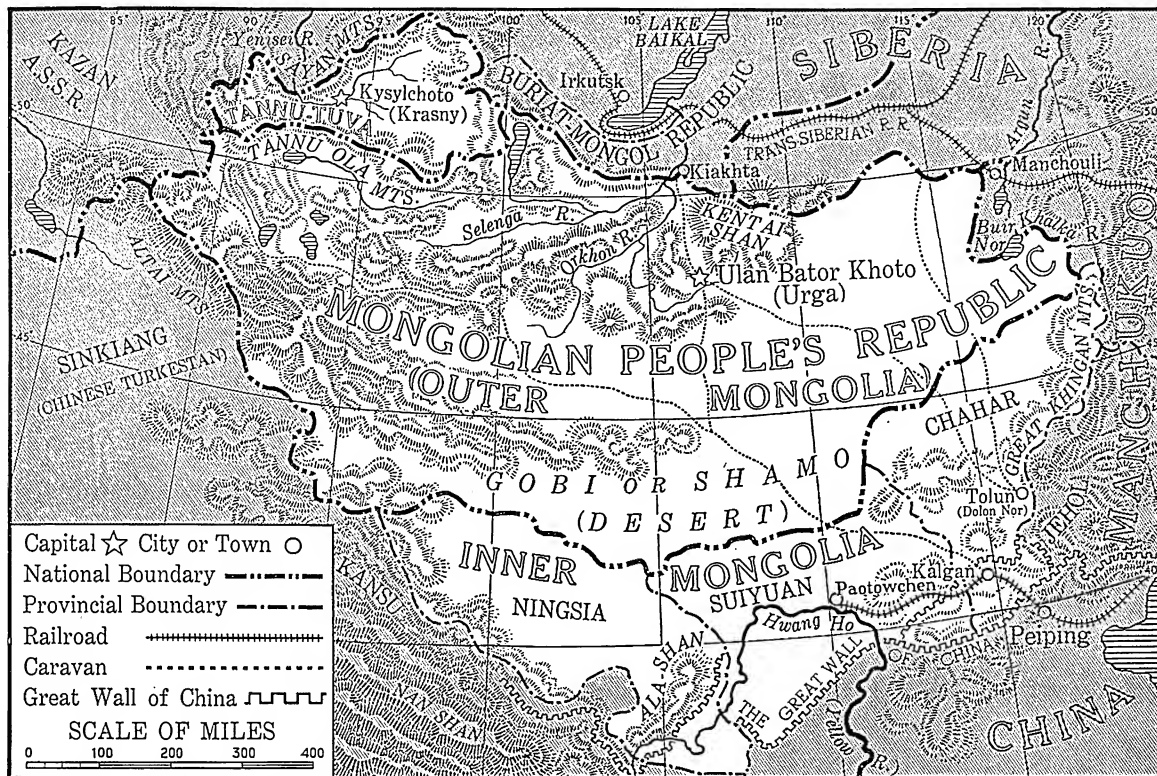
#### AN INGENIOUS WAY OF MAKING FELT



Felt making seems to be a community business. First the Mongols spread a thick layer of sheep's wool, loosely twisted, on a strip of felt and soak it with water or whey. After placing a second felt strip over it, they roll the whole thing on a pole, wrap it in cloth, and bind it firmly. Then they attach ropes to the end of the pole and a camel or a horse drags it over the plain for an hour or two to pack the wool into felt.



## THE MOUNTAIN-RIMMED, OPEN SPACES OF MONGOLIA



This map shows the nature of the Mongolian country, and the political boundaries, as well as they can be determined. Inner Mongolia shows the Chinese division into three provinces; but Chinese control at best is shadowy. Mongolia may be thought of as a great plateau, lying about 4,000 feet above sea level and bordered on three sides by mountain ranges.

they need. The sheep furnish mutton, cheese, butter, sheepskin clothing, and wool for making the felt used to cover their movable homes, or *yurts*, and for bedding. Goats are kept, and in a few localities outside the Gobi the Mongols raise cattle. Most of the cattle are traded or sold, for the Mongol prefers mutton to beef. He uses milk from mares and cows to make a fermented drink, *kumiss*. The shaggy winter coats of the two-humped Bactrian camels are plucked when the hair starts to shed in June; much of this hair eventually is used in American coats and blankets. Wood is scarce, except in the north; so the Mongols burn the dried droppings of animals, called *argul*.

#### Dress and Customs of the Mongols

Sheepskin is the regular garb in winter, cotton cloth in summer. Both men and women like to dress in gay colors. On festal occasions the women wear a gorgeously ornamented headdress. In the Chahar region of Inner Mongolia, this is a net of coral and silver. The women of Outer Mongolia dress their hair in huge grotesque bows like the horns of a mountain sheep. It is said that a Mongol's wealth may be judged by the jewels in his wife's headdress.

Furs, hides, wool, camel's hair, and animals are bartered for foreign luxuries like tea, flour, sugar, tobacco, the cotton cloth used for tents and summer clothing, saddles, boots, and jewelry for the women. Camels are used to carry loads and draw the high-

wheeled carts; but Mongols rely mostly upon horses for transportation. Boys learn to ride at four. A Mongol's stiff boots make walking uncomfortable; he jumps on his pony to go a hundred yards.

The men and boys love to race their horses over courses five, ten, or even twenty miles long, beating the animals the whole way. A fast pony means a fortune to a Mongol, and Mongolian ponies are famous for their speed and hardiness. Mongol horsemanship is seen at its best when a rider captures a wild horse. He stands upright in the stirrups and carries an odd sort of lasso, a long pole with a loop of rope on the end. When he nears the wild horse, he takes the reins in his mouth and uses both hands to throw the lasso loop over the wild horse's neck.

The distance between wells is so great that loss of one's pony may mean death. Therefore, as in the pioneer West in the United States, death is the penalty for horse-stealing.

Next after horses to ride, the Mongol needs dogs, the more savage the better, to guard his yurt or caravan. These are usually large Tibetan mastiffs, but may be smaller mongrels. These dogs are man-eaters, and will attack a stranger on sight.

#### Character of the People

Desert or nomad life is hard and encourages ignorance and dirt. But the Mongol enjoys his life, and achieves a rude plenty which is far better than the

poverty-ridden life of Chinese peasants. Like most desert dwellers, Mongols are hospitable, fun-loving, and self-reliant. They have no chance to grow "soft." Babies two or three years old will run about naked in a wind which would make an American shiver inside a fur coat. Though, to the casual stranger, Mongols may seem lazy, they take necessary hard work uncomplainingly. Children five or six years old begin to herd sheep and goats; a little later they may spend long nights alone in the desert herding cattle and ponies. Mongolian women are as independent as the men, and do all the milking as well as the cooking.

Mongols, like the Chinese, belong to the so-called yellow race; but the tastes and habits of Mongols and Chinese are so different that there is very little racial intermixture. Where the Chinese farmer comes in, the Mongols move on, as American Indians moved

on when the white men came. Many Mongols strikingly resemble Indians in appearance and nature. Such people have little use for fixed dwellings. Only temples, monasteries, and the principal buildings of the few towns are solid wooden structures. Towns may grow up as trading centers and vanish again as the people drift to new pasture lands. Many towns marked on maps of Mongolia are little more than camp grounds, only occasionally filled with tents.

#### Land Held in Common by Tribes

Where ancient tribal customs are still followed, land belongs not to the individual but to the tribe. The tribe has its regular seasonal grazing grounds, and within these limits individuals and families have space allotted to them for the season. In Outer Mongolia, before the foundation of the Mongolian People's Republic, the princes and the lamaseries or monasteries had become great landowners, and the common people had become little better than serfs. On the desert, and in poorer parts of Inner Mongolia, the original nomad freedom still prevails. A commoner may become rich and his children be educated, while a prince may be poor and his children uneducated.

#### Lamas and the Lamaistic Religion

The Mongols are not increasing in number. Many observers attribute this in part to the devotion of the people to Lamaism, a debased form of Buddhism from Tibet introduced among the Mongols some centuries ago. Every family wants to give at least one son to the Lamaist priesthood. The proportion of men thus withdrawn from ordinary family life is very great.

The priests and monks, called lamas, may live in great lamaseries, or they may wander about the country in their red or yellow robes, honoring various households with their presence. Some are intelligent and public-spirited men; most are ignorant and many are unprincipled. Both the lamas and the "living Buddhas," holy men who are supposed to embody

some attribute of the divine Buddha, exercise tremendous power among the people.

#### Recent History

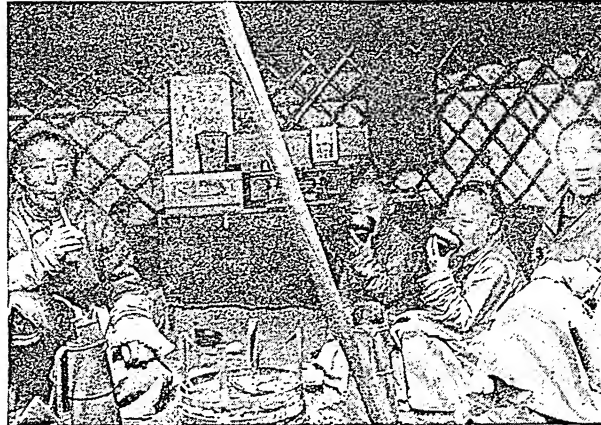
After the Chinese Revolution broke out in 1911, Outer Mongolia declared itself autonomous, that is, independent as far as internal affairs were concerned, and chose as its ruler the Living Buddha of Urga. After 1917 came a period of banditry and savage attempts by the Chinese to reassert their sovereignty, and by the mad White Russian, Baron Ungern von Sternberg, to gain control.

In 1921 Soviet Russian troops entered Outer Mongolia and swept out both the Chinese and the White Russians. Under Russian influence the Mongolian People's Republic was set up with its capital at Urga (now called Ulan Bator), and the Tuvian People's Republic (Tannu-Tuva) was established with its capital at Kysylchoto, which the Russians call Krasny. The constitution of each of these states is formed on the soviet model; the lamas and princes have lost their claims to land and special privileges. Both states, however, still owe nominal allegiance to China.

At the same time Chinese traders, who had hitherto held a rather oppressive monopoly of Mongolian trade, were excluded. The trade which had previously flowed southeast over the old caravan trail from Urga to Kalgan and thence into China, was turned to run north from Urga to Kiakhta in Siberia. Russia gets practically all the trade of both the Mongolian People's Republic and Tannu-Tuva. Both export wool, hides, furs, meat products, and camel's hair. The Mongolian Republic imports from Russia a large number of commodities; grain, flour, and oil products are the most important. Tannu-Tuva imports chiefly textiles, metals, sugar, and oil products. While most of the people live by their flocks and herds, Russian influence, particularly in the Mongolian Republic, has promoted tanning and shoe factories, wool-washing plants, electric power plants, and other industrial concerns. Some coal and gold are mined.

In the borderlands of Inner Mongolia, the rainfall is barely sufficient to permit cultivating such hardy

LIVING SNUGLY IN A YURT



Winter winds may howl but they do not penetrate the Mongol's felt-covered yurt or his sheepskin gown made with the woolly side in. In the background we see the family shrine, which is always placed opposite the entrance. Models of Buddha, paintings of the wheel of life, and other scrolls of Lamaism may be found upon it. The brazier in the foreground is heated with argul. Its four prongs are intended to hold a great iron bowl, the Mongol's only cooking pot.

crops as oats, barley, millet, and kaoliang. Here Chinese farmers have pushed the Mongol herdsmen from the best lands. Naturally the Mongols have grown more and more dissatisfied with Chinese rule. Therefore the Mongols of Jehol (eastern Inner Mongolia) and of the Hsingan provinces of Manchuria, being promised self-rule under Japanese overlordship, willingly cast in their lot with the new state of Manchukuo (*see* Manchukuo).

Japan soon encouraged the rest of Inner Mongolia to seek separation from China. Japan hoped thus to set up a buffer state to shut Russia off from North China and protect Manchukuo against possible attack by Russia through Outer Mongolia. With financial and military aid from Japan, Prince Te Wang of Chahar forced China in 1934 to establish an Autonomous Government of Inner Mongolia, which included virtually all the region. In 1937 Inner Mongolia renounced all connection with the Chinese government, and declared itself an independent state (Meng Chiang), headed by Prince Te.

This extension of Japan's influence westward clashed with Russia's interest in Outer Mongolia (Mongolian People's Republic). As early as 1932 the two major powers gave armed aid to their puppet states in frontier skirmishes arising from border "violations." This "undeclared war" repeatedly threatened to draw Russia and Japan into a major conflict. But in 1939 new problems created by outbreak of war in Europe forced Russia and Japan to sign an armistice and to take steps to arbitrate the border question.

**MONGOLS.** The story of this nomad people of Central Asia is one of the strangest in history. A rude, almost unknown tribe or group of tribes, learning the art of war in obscure struggles with each other and with their civilized Chinese neighbors, they suddenly blazed forth in the 13th century under brilliant military leaders as conquerors of the best parts of Asia and eastern Europe, supplanting native dynasties in one great kingdom after another. Again and again, when the force and ability of the original stock seemed exhausted, fresh and vigorous offshoots renewed the career of conquest. Finally, after making the Mongol name a world terror for several centuries, they have sunk back again into gray obscurity pent within their historic homelands.

Squat wiry horsemen, hunters, and herdsmen, the tent-dwelling Mongols roved over the cold mountain region south of Lake Baikal and the open steppes, much as the North American Indians roamed over the western prairies before the coming of white men. In the early 13th century Genghis Khan (1162-1227), having welded his wild tribes into a remarkably strong and efficient fighting machine, turned this army first against the neighboring Tatar tribes, which he amalgamated with his own, and then against the already collapsing Kin dynasty of China. He took Peking in 1214, and subdued all China except a small portion in the south. Then, turning his armies westward in 1219, like nightmare apparitions out of a dim

land of fable, against peoples who had never heard of Mongols, he swept over Turkestan, Persia, and the southern part of the Grand Duchy of Kiev in Russia. He died in 1227, at the height of his triumph, leaving an empire that stretched from the Amur River and the Yellow Sea to the Persian Gulf and the mouth of the Dnieper on the Black Sea.

The lieutenants of his son and successor, Ogdai Khan, carried fire and sword through Georgia, Armenia, Bulgaria, Hungary, Poland, and nearly all Russia. They displayed, along with frightful ferocity, surprising knowledge of the political affairs of the invaded countries, and a command of military strategy quite beyond that of any European general of the time. The death of Ogdai, and troubles of a disputed succession, recalled the Mongol hordes to Asia and perhaps saved the rest of Europe. Hulagu, a grandson of Genghis Khan, exterminated the Assassin order in Persia, overthrew the califate of Bagdad, massacring the inhabitants of the city (1258), and ravaging Mesopotamia. He destroyed its immemorably ancient irrigation system, and so turned those fertile lands into a desert. Leaving famine and desolation behind, he continued on into Syria. Created governor of Persia by the Great Khan, Hulagu founded a dynasty of practically independent rulers, the Ilkhans of Persia, which lasted until 1353.

#### The Reign of the Great Kublai Khan

A brother of Hulagu, Kublai, who became Great Khan in 1260, completed the conquest of China and founded the Yuen dynasty, which ruled there until 1368. Sovereign or overlord from the Black to the Yellow Sea, Kublai Khan was ruler over more human beings than had ever before owed allegiance to one man. The first of his race to evince traits of benevolence or magnanimity, or any interest in arts of culture, he had adventurers from as far west as Constantinople and even Venice among his ministers, generals, governors, envoys, physicians, and astronomers. It was during the reign of Kublai Khan that the first reports of the wonders of "far Cathay" came to the ears of an astonished and incredulous Europe through the tales of the returned Venetian traveler, Marco Polo (*see* Polo, Marco).

After the death of Kublai Khan the Mongol Empire fell apart into four, five, and then innumerable fragments; yet there was power even in its decaying members. The most important of these, besides the Chinese and Persian empires, was the "Golden Horde," or empire of the western Kipchaks, which established a suzerainty over Russia which lasted until 1480, when the Grand Duke of Muscovy cast off the Mongol yoke.

In the 14th century a Mongol chieftain of Turkestan, said to be of Genghis Khan's blood, though not a direct descendant, once more erected a huge "empire of desolation" covering Persia, Afghanistan, northern India, Mesopotamia, and the greater part of Asia Minor. This was Timur Leng or Tamerlane (Timur the Lame), whose career was used by the



great Elizabethan dramatist Marlowe as the basis for his tragedy "Tamburlaine the Great." His crowning achievement was his conquest of Asia Minor from the Turkish Empire through the defeat and capture of Sultan Bajazet I in 1402; but like their opponents these Mongols were of Mohammedan faith. Timur's method of dealing with a rebellious city was to level it to the ground and sow barley on its site; pyramids of skulls were "his particular architectural fancy." His power died with him in 1405, though his descendants for a time retained a shadowy authority in Persia.

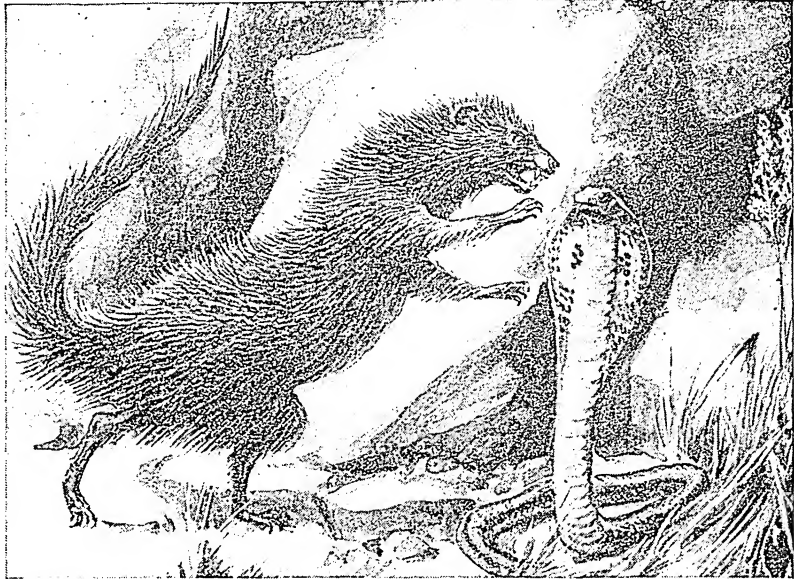
About a hundred years later one of Timur's descendants, Baber (1483-1530), the exiled and outlawed ruler of a petty kingdom in what is now Russian Turkestan, became through a curious combination of pure chance, imaginative daring, and military ability the Mohammedan conqueror of northern India and the founder of the Mogul (Mongol) empire of India. Akbar, Baber's grandson, who ruled India from 1556 to 1605, showed a genius for rule as well as conquest; more, he was a robust and broad-minded statesman who attempted to create a united India out of its unhappy jumble of warring races and religions. He was not merely one of the greatest of Indian rulers, but "one of the hinges of history." In his reign England first entered into relations with India and he was "the Great Mogul" to whom Queen Elizabeth sent a letter. None of Akbar's descendants came up to his stature or had his vision, though his grandson Arunzebe extended the limits of the Mogul Empire. But that power was internally decaying at Aurungzeb's death, in 1707, and under his feeble descendants in the 18th century it fell into the hands of English rulers (*see* India).

The Mongols of the present day are one of the chief branches of Asiatic peoples. They are divided into the East Mongols, living in Mongolia and Tibet; West Mongols or Kalmucks, living in Mongolia and Siberia; and Buriats, living around Lake Baikal, Siberia. They are still tent-dwellers and nomadic herdsmen. Most of them are Lamaistic Buddhists; a few are Mohammedans; and the Buriats still hold to their ancient Shamanism.

The name "Mongolian" was given to the yellow branch of the human family because the early students of anthropology took that people as typical of the yellow race. The designation of "Mongolian" is very unpleasant to such peoples as the Chinese.

**MON'GOOSE.** Every reader of Kipling's 'Jungle Book' knows about Rikki-tikki-tavi, the mongoose (plural, mongooses) who showed such wonderful skill in killing the dangerous cobra snake. These small animals belong to the ichneumon family, which is akin

#### HOW THE MONGOOSE KILLS THE DEADLY COBRA



It is hard to explain the wild fury which takes possession of a Mongoose at the sight of a Cobra, that most poisonous of snakes. The little creature bristles and trembles with rage. Approaching softly, the Mongoose makes a feint, leaping forward and away. The Cobra strikes out again and again, but despite the snake's lightning speed, the Mongoose is quicker. Soon the Cobra becomes dazed and uncertain in its movements. At that moment the Mongoose closes in like a flash, seizes the snake behind that great hood and breaks its neck. The Mongoose frequently eats the Cobra's head, poison glands and all. Although he is in no sense immune to the bite of the snake, when the poison is swallowed it does him no harm.

to the weasels, and there are a number of genera and many species, mostly in Africa and Asia. The Egyptian ichneumon was held sacred by the ancient inhabitants of that land, probably because of its usefulness in killing the asp and other poisonous serpents.

The Indian ichneumon or mongoose is a quick slender animal, about 16 inches long. In spite of its fierce disposition it is easily tamed. When introduced into the British island of Jamaica in the West Indies, the mongoose multiplied so rapidly as to become a serious pest, killing game, poultry, and birds, as well as the rats and snakes which are its natural enemies. With the destruction of birds, many insect pests increased greatly. Accordingly a law passed in 1902 made it a punishable offense to bring a live mongoose into the United States. Scientific name of mongoose, *Herpestes mungo* or *griseus*.

**MONITOR AND MERRIMAC.** On the afternoon of March 8, 1862, five vessels of the United States Navy lay at anchor in Hampton Roads. Suddenly a queer object appeared coming from the direction of Norfolk, Va., which was in possession of the Confederate forces. Men on board the *Cumberland*, one of the United States vessels, described it as "a long-shore meeting-house adrift." Really it was a reconstructed United States ship, the *Merrimac*, which had been

sunk when the Norfolk navy-yard was abandoned at the beginning of the war. The Confederates had raised the vessel, cut off the sides, covered what was left with iron plates, and renamed it the *Virginia*. This was one of the earliest practical applications of armor to a warship.

The queer-looking object steered straight for the *Cumberland*. It was met by a heavy fire, but when it reached the *Cumberland*, its iron beak cut through the side of the wooden vessel "as a knife goes through cheese." The *Merrimac* next set fire to the *Congress* with red-hot shot from her guns. Then the queer vessel steamed away, expecting to return the next day and finish the work.

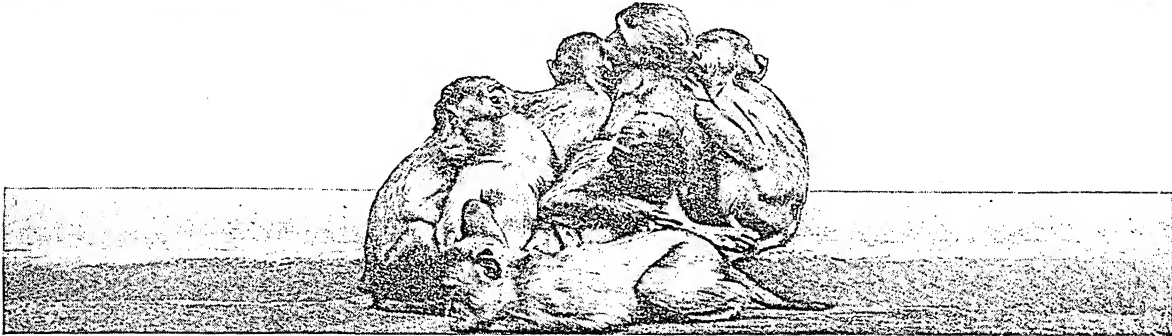
But next morning the situation was entirely changed. When the *Merrimac* started towards the *Minnesota*, thinking to dispose of her as quickly as she had her two victims of the previous day, there suddenly appeared in her path a funny little object, about one-fourth the *Merrimac's* size and resembling

nothing so much as "a cheese-box on a raft." This was the famous *Monitor*, a Federal ironclad designed by John Ericsson, a Swedish engineer.

The fight between the two queer ships began at once and lasted for nearly four hours. The *Monitor* was more easily handled than the *Merrimac*, but her shots could not do much harm to the other's iron sides. On the other hand, the *Monitor's* single revolving turret offered a hopeless target for her opponent. Thousands of people stood on the shore and breathlessly watched the combat, the distance between the vessels varying from a half-mile to a few yards. Finally the *Merrimac*, badly damaged, steamed away to Norfolk.

This fight between the *Merrimac* and *Monitor* was one of the most important naval battles ever fought, for it made all the old navies useless. All countries now had to discard their wooden vessels and begin to build ironclads. As one man said, "The wooden walls of England must now be turned to iron."

## OUR ACROBATIC FRIENDS of FOREST and JUNGLE



*A Visit to the Tropics and the World's Most Playful Animals—The Tribes that Dwell in Monkey Land, Their Funny Looks and Queer Customs—Differences between Old and New World Monkeys*



**M**ONKEY. Can you think of anything that will collect a crowd of children so quickly, or keep them happy so long, as an organ grinder with a monkey? The music is often very dreadful, but the monkey is very funny. His tiny wrinkled face is so comical. It looks like that

of a wise little old man who has seen a great deal of trouble. Like a good clown in a circus, a monkey doesn't have to do anything to make people laugh—except just be a monkey. He is so wonderfully agile, quick, and clever. He mimics everything people do. He "makes faces," and he dances to music; he runs up the telegraph pole, a tree, or a porch pillar, and he swings from bars like a trapeze performer. He picks up pennies, stuffs them in the pocket of his absurd red jacket, and pulls off his collar-box cap for thanks.

It seems a pity that a monkey can only chatter or scream or scold, for he tries ever so hard to talk. Such a mischief he is, too! If he sees a chance he will snatch a little girl's doll or a woman's hat and tear it to pieces. He knows very well such behavior is naughty, for he scrambles out of reach of punishment, and chuckles with glee over the trick. It's easy to forgive the little rascal, for the next instant he does something engaging. He cuddles his baby, or cracks a peanut like a squirrel, turns a hand-spring for you, or slyly pulls another monkey's tail.

Just what is a monkey?

### The Great Variety of Monkeys

In the big cage in a menagerie or zoo there are a dozen or more varieties of monkeys as unlike each other as a fox terrier is unlike a St. Bernard dog. Some monkeys are as small as squirrels and others are as large as cocker spaniels. There are monkeys, or apes, with long curly tails, with straight tails, bushy tails, stub tails, and no tails at all. Some have very

## WHAT DO YOU SUPPOSE THESE MONKEYS ARE THINKING ABOUT?



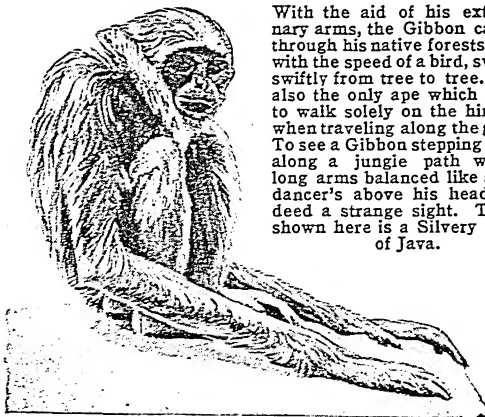
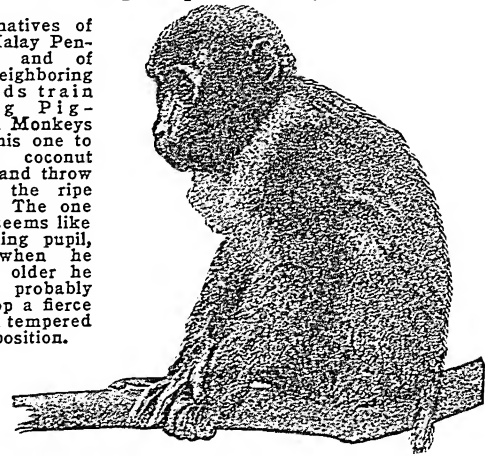
You can almost imagine that they're sitting in a station waiting for a train or lined up in the grandstand watching a baseball game. That first one—the Pig-Tailed Monkey—might well be a serious business man, with no nonsense about him. The Angola Colobus next to him is the very image of an old white-haired lady, who has lost her teeth; and in the middle the Rhesus or "Bandar" of India resembles a mischievous schoolboy in appearance as well as in habits. But what do you think of Number 4, with his puffed-up expression? They call him Humboldt's Woolly Monkey, but you might almost take him for a pompous little lawyer; and right there beside him, peering from under his white eyebrows, sits the gruff and solemn judge—the White-Collared Mangabey.

hairy, and others nearly naked, faces. There are dog-faced and purple-faced monkeys; monkeys with white cheeks, with turned-up noses, with tufted ears, with whiskers, mufflers, and bonnets. Most of them are black, gray, or some shade of brown, from silver-fawn to seal. But there are dandified monkeys with green coats and orange vests.

Many people include the big apes—the gorillas, chimpanzees, orangutans—under the name "monkeys." But this is a loose and confusing usage. It is better to refer to these higher forms as *apes*, for there are greater differences in physical structure between the higher apes and some of the monkeys than there are between the higher apes and man. The true monkeys should also be distinguished from the lemurs and other lemur-like animals, which make

monkey lives in a village in the trees, when he is at home. There is a wise old male for a chief. He and the older males keep trespassers away from a chosen

The natives of the Malay Peninsula and of the neighboring islands train young Pig-Tailed Monkeys like this one to climb coconut trees and throw down the ripe fruit. The one here seems like a willing pupil, but when he grows older he will probably develop a fierce and ill tempered disposition.



With the aid of his extraordinary arms, the Gibbon can race through his native forests almost with the speed of a bird, swinging swiftly from tree to tree. He is also the only ape which prefers to walk solely on the hind legs when traveling along the ground. To see a Gibbon stepping gravely along a jungle path with his long arms balanced like a ballet dancer's above his head is indeed a strange sight. The one shown here is a Silvery Gibbon of Java.

up the lowest group of the Primates—the order which also includes monkeys, apes, and man. (See Ape; Lemurs; Man.)

Monkeys inhabit the warm regions of both hemispheres. They are found in China, Japan, India, and southern Asia to and including the Malay islands, and in all parts of Africa except the deserts. In Europe they are found only at Gibraltar. The New World monkeys are found in the tropical regions of Central and South America, east of the Andes Mountains.

A monkey in captivity is happier in a cage with a number of other monkeys. "The more the merrier" is the rule in monkey land. Nearly every kind of

feeding place, and he leads his followers to a new home when they move. Early in the morning and late in the evening seems to be playtime in monkey town. All the monkeys leap and swing and chase each other through the trees, and "whoop and holler," as Riley says, like so many boys playing in the woods. Spoiled boys they are, too, doing a great deal of mischief by throwing down coconuts and other fruits and nuts, just to see them fall or to vex passers-by.

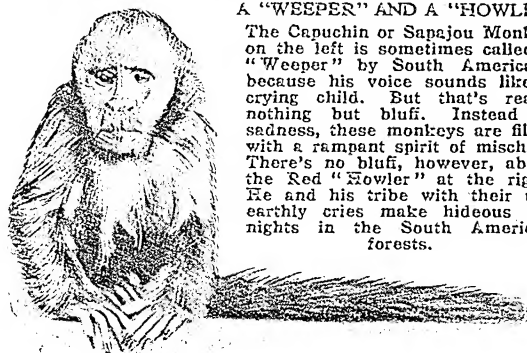
Some of these monkeys have the prettiest homes! They camp out all the year round. They love the dense woods of very hot countries. In the beautiful tropical forests along the Amazon River of South America, monkeys live in bowers in the trees, among red and green parrots, butterfly orchid blossoms, brilliant insects, and flowering vines. They live in thousands of tropical islands in the sea, among palms and fruit trees. But a few are found in colder countries—in Mexico and in the mountains of India, in Japan and northern Africa, and even around the great fortress rock of Gibraltar, in Spain.

No matter how much monkeys may differ in other things, they are all alike in having four *hands*. The bear, the lion, the elephant, the dog—nearly all the animals you can think of—have four *feet*. Girls and boys have two hands and two feet. A foot has a long



## A "WEEPER" AND A "HOWLER"

The Capuchin or Sapajou Monkey on the left is sometimes called a "Weeper" by South Americans because his voice sounds like a crying child. But that's really nothing but bluff. Instead of sadness, these monkeys are filled with a rampant spirit of mischief. There's no bluff, however, about the Red "Howler" at the right. He and his tribe with their unearthly cries make hideous the nights in the South American forests.



sole and short toes, usually, and the toes cannot grasp and hold things. A hand has a nearly square palm, fingers much longer than the toes, and a thumb. In the best kind of hand the fingers have three joints each, and can all be brought together in many positions, and even closed into a fist. All four of a monkey's feet are really hands, with grasping fingers and more or less perfect thumbs. That is why a monkey is so clumsy on the ground. Usually he walks on the outside edges of the palms of his hands, with fingers and thumbs curled in. This gives him a funny bow-legged look. But just watch him on a tree or a perch, or clinging to the wires of his cage. He's as much at home in a tree as a bird or a squirrel.

Even if a monkey cannot talk, he can tell you very plainly where he lived when he was at home—that is, whether he is an Old World monkey, from Asia or

fellow who comes up to you and give him peanuts, one at a time, as fast as he can take them. If he is an Old World monkey he will stow those nuts away in

## FEET THAT ARE REALLY HANDS



The big toe of most monkeys is exactly like a thumb, so that they can grasp objects with their feet as well as with their hands.

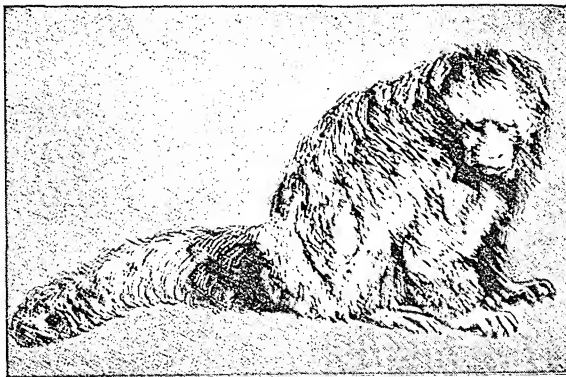
cheek pouches like a squirrel. He can put a surprising number away, for those pouches stretch and stretch like little rubber balloons. Look at him carefully. His nose, of course, is flat, but the two holes are near together. And when he goes up to a bar to eat his nuts, he does not use his tail in climbing or for holding on.

A South American monkey's nostrils are far apart. He has no cheek pouches, but heaps as many nuts as he can carry in his two front arms, as you carry packages. But he can keep other monkeys from taking his nuts when he climbs, for he uses his long curly-tipped tail for a fifth hand. With five hands for grasping, the South American monkey is a wonderful trapeze performer. The tree-squirrel climbs faster,

## SOME QUEER STYLES OF MONKEY LAND



On the left is a "White-Eared" Marmoset. You can see plainly why they call him that. He is a delicate timid little creature whose home is in Brazil. On the right is Humboldt's Saki, a native of the upper Amazon. His general color is black with a gray grizzle of white-tipped hairs mixed through the black. He looks as if he had upset a pail of whitewash on himself and was worried about it.



Africa, or a New World monkey from South America. The monkeys in a zoo always come to the netting when visitors appear, for they are very curious and want to see everything that is going on; besides, they have learned that some especially friendly little boys and girls carry bags of peanuts. Select any little

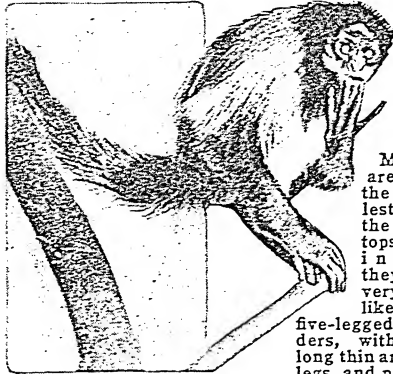
the flying squirrel leaps farther, the bat clings better with his wing-hooks; but no other animal can climb, leap, and swing across a wide forest, 40 feet from the ground, the way the South American monkeys can. "The acrobats of the animal world," they seem to be made up of wire springs that are tireless.

They do not leave the trees except in case of necessity, and they drink while clinging to a bough which overhangs the water. They feed on leaves, fruits, insects, eggs, the young of birds, and on honey. American monkeys seldom damage man's productions, but they are hunted for their flesh and fur.

The South American monkey that you see oftenest with the organ man is a small rusty-brown animal, about as big as a toy terrier. He has a curved hair-covered tail, good thumbs, a rather pleasant whistling chatter, and a careworn anxious face, as if he expected nothing in life but bad news. He is bright and obedient, so he soon learns his tricks and performs them willingly. He likes to ride on a dog's back, on his master's shoulder, or on the organ. Another favorite of the organ man's is the Capuchin monkey. You may know him by the queer way in which the hair grows around his face, like a hood or cowl of a Capuchin monk.

Sometimes in school you learn a rule, and then the teacher will tell you that there are times when the rule doesn't work. The marmoset, the smallest and prettiest of all South American monkeys, cannot use

## A SOUTH AMERICAN "SPIDER"

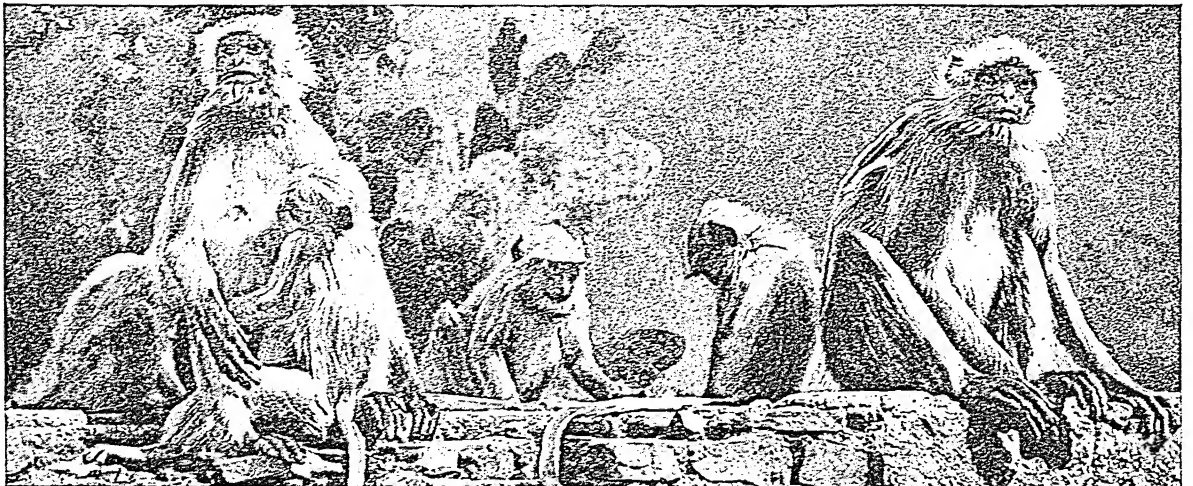


Spider Monkeys are among the nimblest folk of the tree tops. And indeed they look very much like huge five-legged spiders, with their long thin arms and legs, and powerful tail.

There is a squirrel monkey from South America only a little larger than his nut-cracking namesake. He has a gray face and a black nose, but has long hind legs, so that he leaps somewhat like a kangaroo. When he is happy he shows it by grinning, and when he is hurt tears come into his eyes. In his home in the Amazon forests it rains torrents sometimes, as if the bottom had fallen out of the clouds. When caught in such a storm a troop of these squirrel monkeys huddle together in the thickest tree they can find, and put their tails around each others' necks for company and comfort.

These marmosets and squirrel monkeys have some of the noisiest neighbors—the "howling" monkeys. They have a larynx or voice box with six pockets, which reflect the voice and give it unusual strength. They begin howling at sunrise, keep it up until the next sunrise, and then take a fresh start. The woods ring and echo with their howls. They travel all the time through the high branches of the trees, the males leading and the mother monkeys following, each with one or two babies clinging to her neck with fingers and tails. They swing by their tails and catch the

## THE SACRED GRAY "PEOPLE" OF INDIA

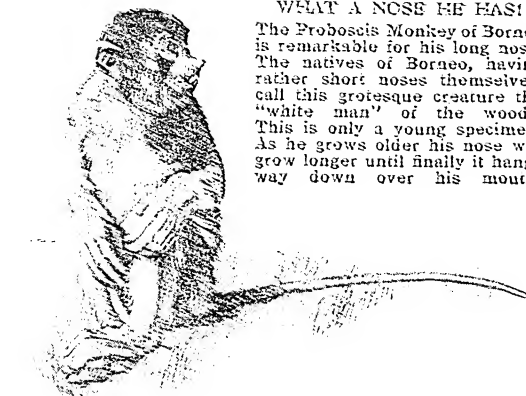


The Hindus look upon the Hanuman Monkeys as the living representatives of one of their gods, and so protect them from harm. The result is that these mischief makers gather about Hindu villages in family groups like this one, and live luxuriously off the farmer's crops. Sometimes when the Hanumans threaten to eat everybody out of house and home, the desperate villagers go out, and, with many apologies, capture the tame monkey folk and deport them far into the jungle, treating them meanwhile with the tenderest care.

his tail in climbing. When children see the marmoset they always cry: "Oh, what a little dear!" He is no bigger than a chipmunk. He is only eight inches long, with a furry body and a foot-long bushy tail that he carries like a plume. If it weren't for his almost human little face and hands, and his winglike tufted ears, you might think him a squirrel.

next limb with a hand. The brown howler is bad enough, but the red howler makes the night hideous with his cries. They screech as if all the animals in the forest were eating one another up. Some zoos won't have little-old-man-howler, as he is called, at all. He disturbs the other animals, and is altogether too much of a nuisance.

Another South American monkey is the saki. He has a ruddy back, and an almost human habit of cupping a hand and dipping up water when he wants to drink. He is so delicate that he seldom lives long in captivity, so you may never see him. But you are sure to see the spider monkey. He has such long



#### WHAT A NOSE HE HAS!

The Proboscis Monkey of Borneo is remarkable for his long nose. The natives of Borneo, having rather short noses themselves, call this grotesque creature the "white man" of the woods. This is only a young specimen. As he grows older his nose will grow longer until finally it hangs way down over his mouth.

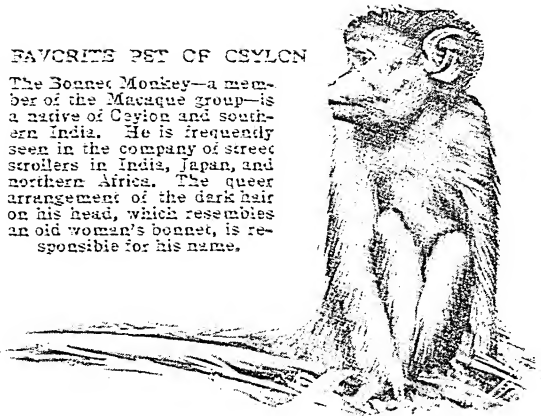
slim arms and tail and such a small body that he looks like a big, hairy spider. But really he is very gentle and even affectionate. He has little stumps of thumbs, or no thumbs at all, and often uses his tail to convey food to his mouth. A mother spider monkey likes to sit down and cuddle her baby in her arms.

So many of the Old World monkeys have only little stubs and lumps of thumbs that scientists put them into one family of "cut-off-thumb" monkeys. If you see a monkey with a very fine, long-haired silky coat, particularly if he has cheek pouches and makes no use of his tail, look for shrunken little thumbs. His coat makes pretty monkey-skin collars and muffs. One monkey of the mountains of Abyssinia, where it is cold, looks as if he were wearing furs himself. He has a fringe of white down either side his jet-black velvet body, a white tippet under his chin, a white edge to his cap, and a white tip to his tail.

Another monkey of the hot west coast of Africa wears the hair on top of his head in a crest, with a parting on each side, something like the way grandmas used to comb your papa's top hair, in a long fat curl called a "roach." This crested monkey looks very comical indeed, for besides his roach he has whiskers under his chin. A near neighbor of his in the African jungle is the "face-maker." He is a very good-tempered teachable little fellow. The variety of queer faces he can make always draws crowds, so he is always a great favorite with organ men, circuses, and zoological gardens.

#### A FAVORITE PET OF CEYLON

The Bonnet Monkey—a member of the Macaque group—is a native of Ceylon and southern India. He is frequently seen in the company of street strollers in India, Japan, and northern Africa. The queer arrangement of the dark hair on his head, which resembles an old woman's bonnet, is responsible for his name.



The guenon is the most sympathetic of African monkeys. It is commonly found in zoological gardens. It is a small graceful creature with fine hands, long thumbs and tail, big cheek pouches, and large hairless parts called callosities. It is a lively, merry monkey. It lives in troops under the leadership of an old, experienced guenon, and when a raid on a cornfield is made, this master leads, and the females follow, carrying their young. They travel in tree-

tops until the field is reached and descend at a signal of the leader. The cheek pouches are quickly filled; then the rest of the crop is wasted in an attempt to select the choicest ears. If danger threatens during the raid the leader gives the signal for retreat, each mother grasps her child and as much corn as she can carry, and all take to the tree-tops again. With proper care they thrive in captivity and give tender care to their young and the weak and helpless members of their kind.

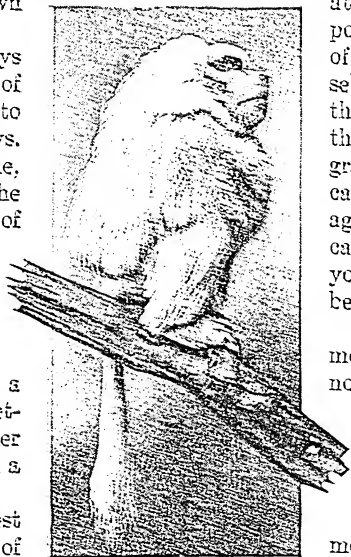
Among the brown and gray and black monkeys in a zoo, you will be sure to notice any that are brightly colored.

There are a red- and a purple-faced monkey; a Diana monkey, with a pretty white crescent like a new moon on the forehead, a white beard and neck scarf; and a monkey with a blue mustache above yellow whiskers—he is called the "mustache" monkey. The green monkey, whose home is in the region of the Nile, is quite a dandy. He is dressed in dark green and black, set off with dull orange whiskers, throat band, breast-plate and tail-tip. He was introduced

into the Lesser Antilles some 200 years ago

At first sight the hanuman monkey of the East Indies doesn't look especially interesting. He is a little spider-legged animal three or four feet long, with cream-colored fur and black hands and face.

#### SACRED BABOON



Pictures of this dog-like creature are found in great numbers on monuments of the ancient Egyptians, by whom he was held sacred. He dwells mostly in Arabia and Abyssinia, and is also called the "Mantled" Baboon because of the long mane worn by the males.



But he is a privileged being. In his native land he is sacred to Hanuman, the monkey-faced god. The Hindus have a legend that Hanuman, with the aid of a monkey army, helped rescue the wife of the divine hero Rama from a demon. Another legend is that Hanuman brought men a stolen gift, the mango, a valued Indian fruit. For the theft the monkey was condemned to death by fire; but it escaped with only its hands, feet, and face burned, and these have been black ever since! The Hindus are afraid to interfere with these monkeys, so the animals go freely in troops into the villages, help themselves to grain, fruits, and nuts in shops and houses, and destroy things from wanton mischief. Stories are told of whole tribes of the hanuman monkeys swarming into dining rooms and eating wedding feasts. In some Hindu communities these monkeys live in the upper stories of the homes of the natives. If one native bears another a grudge, he places rice or corn on the enemy's roof during the rainy season. When the monkeys see this they eat the grain that is within reach, then tear up the tiles of the roof to secure the particles which have fallen into the crevices, and so the house is opened to the rain.

Another mischievous monkey is the magot, who lives in northwestern Africa and in Spain around Gibraltar. He is about as big as a terrier dog. Bands of these monkeys will go to a fine garden and set sentinels in trees and on rocks to watch, while the others eat and destroy melons, figs, grapes, oranges, and almonds. This habit lands many of them in zoos, because they fall into traps set for them on their forays. In the early days when naturalists and surgeons were forbidden to dissect human bodies, they learned much about anatomy by studying the bodies of the magots.

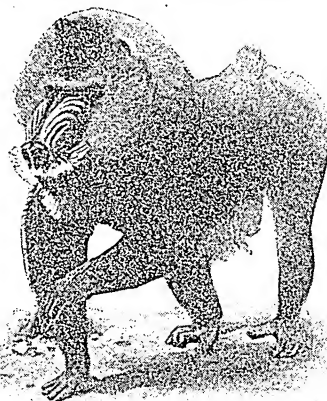
#### The Macaque or "Bonnet" Monkeys

Street strollers of India, Japan, and northern Africa lead about the macaque (*mā-kāk'*) or "bonnet" monkeys. These monkeys are sturdily built with short tails, and their hair grows in a frill around the face. These bonnet monkeys are quick and clever. One kind loves crabs, and has learned to swim and dive for this favorite food. The pig-tailed bonnet monkey of the East Indian Islands is captured and trained to climb up the tall palms and pick coconuts for its owner. The rhesus monkey is the common macaque of northern India. Like the hanuman, it is venerated by the Hindus and makes a nuisance of itself with its boldness and its mischievous habits. Some of the rhesus monkeys live in the high northern mountains, where they have acquired a thick undercoat of wool to keep them warm.

Borneo is the home of the long-nosed or proboscis monkey. The male has a long and beaklike nose, which can be moved in all directions. The fur is red, thick, and soft, and about the neck it is nearly a foot long, forming a heavy collar. The snub-nosed monkey of northwestern China and Tibet has a funny little snout that turns straight up in a point.

The baboons, or dog-headed monkeys, seem to many people to be the ugliest and most repulsive members of the monkey tribe. They are found only in Africa and Arabia. In size and habits they come between the apes and the tree-dwelling monkeys. A few of them live in forests and climb trees, but most are found in rocky ravines or on hills where grass and trees are scarce. Large bare callous spots, often brilliantly colored, on their hind-parts give them a startling appearance. Their long blunt muzzles look somewhat like dog muzzles, with nostrils at the extreme end, and great canine teeth. They run swiftly on all fours, but they climb trees with difficulty. They go about in

#### THE HIDEOUS MANDRILL



Among the most repulsive looking creatures in the world is the Mandrill, a species of Baboon inhabiting West Africa. Stump-tailed, unshapely, with a fierce glowering aspect, this creature is further disfigured by swellings on its face which are colored a vivid red and blue.

great droves, and, led by their old males and guarded by sentinels, they can defend themselves successfully against other wild beasts, even leopards. Their food is chiefly insects, small animals, vegetables, and fruits. In their raids on plantations they often work havoc.

About a dozen different kinds of baboons are known. Of these the mandrill is the largest and fiercest. This brute is larger than a mastiff; it has short legs, a heavy body, immense canine teeth, and a stump of a tail less than two inches long. It is especially remarkable for the brilliant flower-like hues of the hairless portions of its face and body. Its cheeks are an intense blue, while the central line of the nose is a brilliant scarlet.

The mantled, or hamadryad (*hām'a-dri-ād*), baboon of Arabia and northeastern Africa was worshiped by the ancient Egyptians and was often pictured on their monuments. Its solemn appearance gained it credit for great wisdom. It is remarkable for the shaggy coat of grayish-green hair that covers its head and shoulders, and the flaming red of its callous spots.

Another baboon known to the ancient Egyptians is the anubis, with an olive-gray coat, darker paws, and a crest on the nape of its neck. It is found in the Sudan, Nubia, and on the west coast. The yellow baboon has no crest, is yellowish in color, and is found all across equatorial Africa.

Amazing stories are told of the intelligence of the chacma baboon of South Africa, which is nearly as large as the mandrill, but is much more gentle in early life. In several instances chacma baboons are said to have been trained to act as shepherds, driving the

sheep to and from pasture and protecting them from danger with self-sacrificing devotion.

Monkeys are a bread and butter staple of the animal trade. The rhesus and the capuchin are the most common, retailing to zoos, pet stores, and scientific laboratories for \$15 or \$20. The woolly monkey of South America is considered expensive at \$75, and as much as \$200 has been paid for a colobus monkey from Africa. Among the rare species seldom seen in captivity are the giant spider monkey of South America, the proboscis, and the snub-nosed monkeys. One reason for this is the difficulty or impossibility of providing them with their natural food. Most zoological parks and pet stores buy their animals from importers, who in turn buy from natives. A few large-scale buyers have their own agents who go into the jungles and deal directly with the natives.

Monkeys fall into two distinct divisions—the *platyrrhine* or broad-nosed monkeys of Central and South America, and the *catarrhine* or narrow-nosed monkeys of Asia and Africa.

*Catarrhine Division.* Nostrils closely compressed, opening downwards; 32 teeth; many species terrestrial, spending much of their time on the ground; tails useless for grasping; most species with well-formed, opposable thumbs; callosities or calloused bare spots, often highly colored; either cheek pouches for the storing of food, or chambers in the stomach which serve the same purpose.

*Platyrrhine Division.* Widely-separated, out-flaring nostrils; 36 teeth; living entirely in trees; tail used for grasping by most species, serving as a fifth hand; thumb absent or undeveloped, not opposable and so unable to pick up objects; no callosities; no cheek pouches or stomach compartments. Marmosets differ from the other monkeys of this group in having only 32 teeth.

This distinction between the monkeys is one of the most singular and interesting mysteries in zoology. Apparently the differences have existed as long as there have been monkeys. No fossil remains intermediate between the two types have ever been found. Nor have fossils of one type ever been found in the hemisphere now inhabited by the other. They must, therefore, have originated from two separate stocks of ancestors. If this is true, however, it is hard to understand why they have not diverged further in structure and habits.

The New World or platyrrhine monkeys are the more primitive group. They compose the family *Cebidae*; marmosets belong to the family *Hapalidae*.

The Old World or catarrhine monkeys belong to the family *Cercopithecidae*, which is divided into two sub-families: *Cercopithecinae* and *Semnopithecinae*. The *Cercopithecinae* have cheek pouches and short tails. They include the macaques, baboons, magots, and guenons. The *Semnopithecinae* comprise the langurs, the guerezas, and the proboscis monkey. These have long tails and no cheek pouches.

Monkeys fall into the order *Primates*, which is divided into three sub-orders. *Anthropoidea*, including man, apes, and monkeys, is the most highly developed. Below the monkeys in the evolutionary scale are the *Lemuroidea*, lemurs; and the *Tarsioidea*, tarsiers.

## The Three Wise Monkeys of Japan



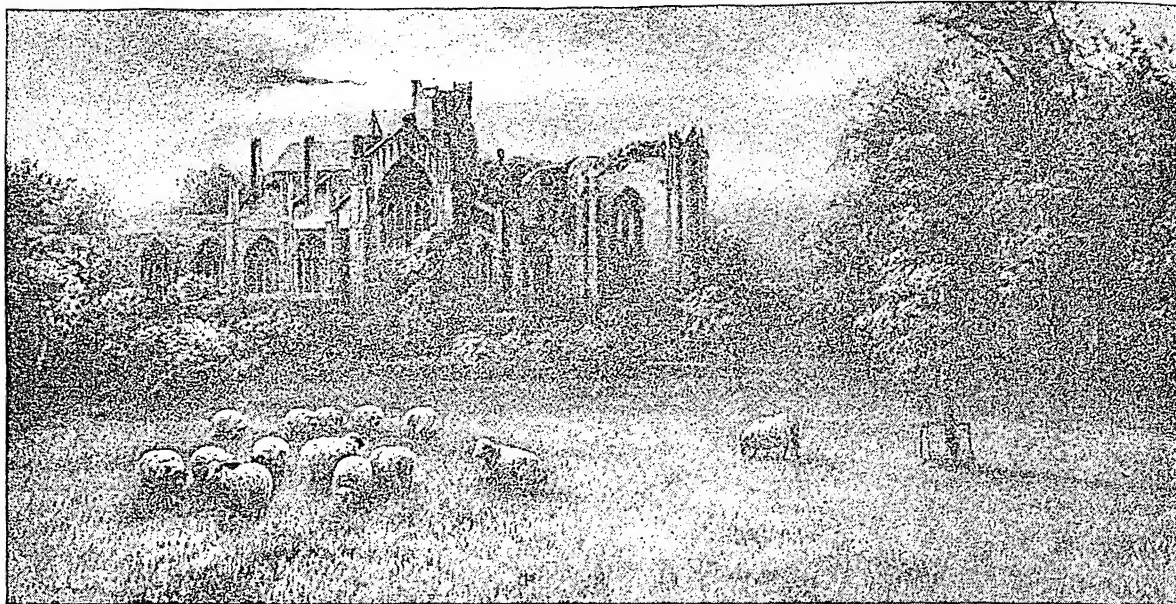
THESE are the three wise little Japanese chaps, who "see no evil, hear no evil, speak no evil." They are carved in an open grille panel above the door of the royal stable in the group of temples at Nikko, Japan. Their names are Mizaru, "see no evil" (at the right of the panel), Kikazaru, "hear no evil," and Iwazaru, "speak no evil." The intricate wood carving, delicately colored in shades of green, pink, peach, and brown, is the work of Hidari Jingorō (1594-1634), the great left-handed ("Hidari" in Japanese) artist who did many of the finest carvings at Nikko.

The Three Mystic Monkeys, known in Japan as the Sambiki-saru, represent Buddhist teachings on the three principal temptations. The idea is very old, for the three monkeys are represented in ancient Japanese

statues showing Hindu influence; they appear on the headdress of one of the ancient deities. The Sambiki-saru are associated with the long-nosed Shinto god, Saruta Hikō, and they are the attendants of the Buddhist Kōshin, god of the roads, who is depicted as a monkey-headed man.

The stable at Nikko houses the sacred white horse, kept for the use of the gods in the temple of the great shogun Iye-yasu. It has long been the custom in Japan to keep a monkey in the imperial stable to entertain the horses. Horse and monkey are associated, moreover, in Japanese mythology. They represent human feeling and human thought, expressed in the old proverb, "The heart is like the monkey, while the head is like the horse."

## LIFE in CELL and CLOISTER



Melrose Abbey—what memories must live in these venerable stones! Can you not imagine that on moonlit nights the spirits of the old Cistercian monks revisit the ruins of their historic monastery? Can you not see them marching out to the fields to work, their robes girded up above their bare legs? Can you not hear the solemn midnight chants in the moss-grown chapel? Or perhaps it is the tramp of shouting men-at-arms with torches and glittering weapons, for three times after it was built in 1136 was this famous Scotch monastery burned down by English soldiers. Celebrated in the writings of Sir Walter Scott, Melrose Abbey is today preserved as part of the estates of the Duke of Buccleuch.

**M**ONKS AND MONASTICISM. The word "monk" (from the Greek *monachos*) originally meant a solitary, or one who lives alone, but in course of time it came to mean a member of a religious community. Similarly the word "monastery" meant a cell or hut, and then came to mean a community of men or women devoted to the service of God and obeying a fixed rule. In the early days of Christianity there lived in the great Egyptian desert called the Thebais numbers of solitaires or "hermits" (from the Greek, *eremites*, "a dweller in the desert"). The most celebrated of these was Paul of Thebes, who lived toward the middle of the 3d century. These hermits were remarkable for their self-denying or "ascetic" mode of life.

The first monastic organization dates from the year 305, when Saint Anthony established a monastery at Phuim, on the banks of the Nile. This, however, was not a monastery in the strict sense, as the brethren lived in separate huts, and though under Saint Anthony's direction, they lived a life which was largely suggested by

individual fancy. The first community of monks living under a common roof was established by Pachomius in the year 340, at Tabenna, an island of the Nile.

He compiled the first monastic rule. The difference between the monks under the guidance of Saint Anthony and those under the direction of Pachomius was chiefly this, that the former spent all their time in the reading of the Scriptures, in prayer, and works of mortification; while the latter led an active life in which religious exercises and the reading of the Scriptures alternated with daily labor in the fields.

From Egypt monasticism spread into Asia Minor and Syria; and about the year 360 Saint Basil established a great monastery near Neo-Caesarea, in Pontus. He is regarded as the founder of Eastern monasticism, of which the famous monastery at Mount Athos is the modern representative. Saint Basil laid down the principle that the monk must not live for himself alone, but must do good for his fellow-man. In order to give his monks an opportunity to put this into effect he established hos-



This picture, like others in this article, is reproduced from ancient drawings made by the monks themselves. It shows a Benedictine of the Middle Ages. Hard work was the guiding motto upon which was founded the Benedictine order. Its members were formerly known as "Black Monks" from the color of their robes.



pitals, hospices, and orphanages near the monasteries under his care. He also provided schools for the education of boys, not necessarily with a view to their becoming monks. He discouraged excessive asceticism, and taught that work is of greater value in the monastic life than self-imposed mortifications or punishments. Accordingly, the time of the monks was divided between prayer, good works, and the reading of the Scriptures.

Monasticism was imported into Italy directly from Egypt at an early date, and monasteries of men and women soon became numerous throughout the Italian peninsula, especially in the neighborhood of Rome. Thence it spread into Gaul, where Saint Martin of Tours founded the monastery of Ligugé, near Poitiers, in 360. Even more celebrated than Ligugé was the monastery of Lérins, which gave to the church of Gaul some of its famous bishops and saints. Saint Patrick, the Apostle of Ireland, was trained there. There is little known of Spanish monasticism before the close of the 5th century; but there were many great monasteries in Wales and Ireland, each with many hundred monks. Undoubtedly the chief glory of Celtic monasticism is its missionary work, the results of which are to be found all over northwestern Europe.

The greatest name in the history of western monasticism is that of Saint Benedict of Nursia, who was born about the year 480. His 'Rule' set forth the details of the monastic life in a way that had never been done before. According to Saint Benedict's idea, the great disciplinary force for human nature is work; idleness is its ruin; work is the first condition of all growth in goodness. Even prayer comes after work, for grace meets with no coöperation in the heart of the idler. When the Goth went to visit Saint Benedict in his monastery at Subiaco, he gave him a bill-hook and sent him to clear away briars to make a garden. "Go and work," was his advice. He taught that work is not the duty of slaves; it is the universal lot of mankind, necessary for his well-being as a man, and essential for him as a Christian. The religious life as conceived by Saint Benedict is essentially social, where prayer alternated with social duties.

The influence of Benedictine monasticism was evidenced in many ways during the Middle Ages—in the conversion of the barbarians and the civilization of Europe; in the development of agriculture, for it has truly been said by a great historian that the Benedictines were the agriculturists of Europe; in the cul-

tivation of learning and the teaching of crafts and trades, such as painting, wood carving, working in metals, carpentry, weaving, tailoring, the tanning of leather, and clock-making. English Benedictines were the greatest clock-makers of the 14th century; and one of the most wonderful clocks ever devised was the work of Peter Lightfoot, a Benedictine of Glastonbury. This clock, now in the South Kensington Museum in London, was formerly in the tower of Wells Cathedral in Somersetshire.

Nearly all the great orders of the Middle Ages were

founded on the Benedictine plan, though differing in certain details. The most notable of these were the Carthusians, so called from the Grande Chartreuse near Grenoble, in France, founded by St. Bruno in 1086; the Cistercians, or "White Monks," founded by Saint Robert Molesme, in 1098 (now known best as Trappists); and the Premonstratensians, or "White Canons," named from Premontré, in France, founded by Saint Norbert in 1120. The Benedictines were formerly known as the "Black Monks," from the color of their habit.

The monasteries were all self-contained communities and as a rule were divided into abbeys and priories, of which the abbey church was the central figure. Around this were grouped the numerous buildings constituting the monastic compound. Our English word "minster" derives from monastery, through the French; we find it still in use in such designations

as Westminster Abbey, York Minster, and elsewhere.

In all monastic churches the plan was governed by certain common necessities: (1) A choir had to be provided for the chanting of the "canonical hours" by the monks. The canonical hours are fixed forms of prayer which every Catholic priest is bound to recite daily, viz., matins, lauds, prime, tierce, sext, none, vespers, and compline. (2) A sufficient number of altars was necessary, so that the priests of the monastery might be able to celebrate mass at fixed hours. (3) Arrangements had to be made for processions which were held every Sunday.

Next in importance to the church was the cloister, which, as its name implies, was an inclosed space, surrounding all four sides of a rectangular court known as the "garth." The four walls of the cloister were roofed in. Here the older monks labored at appointed duties, such as the copying of manuscripts and writing; here, too, the younger members of the community toiled at their studies under the direction of teachers. Then came the refectory, or as it is called the "fratry"



The Cistercians, or "White Monks," were established under rules even more austere than the Benedictines. The Trappists, a later branch of the order, are noted today for the privations to which they subject themselves.

or common dining-hall, which was always located at some distance from the church. The floor of the refectory was covered with straw or rushes changed three or four times in the year. Close to the refectory was the kitchen. The dormitory usually was near the cloister. In early times it was simply an open apartment without screens. Later, partitions were introduced, and each monk had a small room where he studied as well as slept.

A most important feature of every monastery was the infirmary, or house for the sick and the aged. It was placed near the dormitory and close to the garden, or "herbarium," where herbs used in compounding medicines were cultivated. The care of the sick was especially enjoined upon the superior of every monastery by the Benedictine Rule. A guest-house was a necessary part of the establishment; and near the gate of the monastery there was invariably a shelter for travelers. Every religious house had an almonry, or place where the poor could receive alms, in the name of Christ. To the almonry was usually attached a free school for poor boys. Near the cloister there was a common-room or "calefactory" (warming place) where the monks might resort in winter to warm themselves at the common fire, which was lighted on the Feast of All Saints, November 1, and kept burning daily till Easter.

Libraries as we know them today were not found in the old monasteries; but manuscripts and copied books were carefully preserved in lockers or cupboards in the church or in the cloister. By the 15th century, however, libraries were common, many of them very large and splendidly arranged, with "cubicles" or small writing rooms. In addition to the foregoing parts of the monastery there were numerous buildings set apart for various kinds of work, such as carpenter shops, book binderies, forges, mills, bake-houses, and barns. All of these were under the supervision of a chamberlain, or procurator.

All the inmates of a monastery were under the government of an abbot (from the Latin *abbas*, "father"), whose authority was supreme. Next came the prior; and then his assistant, the sub-prior. There were several officials known as *obedientaries*—such as the cantor, or singer; the precentor, or chief librarian and archivist; the collarer, or bursar; the rectorian; the kitchener; the infirmarian; the almoner; the chamberlain; and the novice-master. The position of abbot was one of great power and influence.

The daily life of a monastery was minutely ordered. The day between sunrise and sunset was divided into 12 equal parts or *horae*, and likewise the night, or from sunset to sunrise, into 12 equal *horae*. The hour for rising was about 2 a.m. On rising the monks went to the church, or oratory, for the vigils or night office, matins, and lauds. Meditation and other prayers followed. Prime was said at sunrise, after which they went to their appointed work till 10 o'clock. Tierce was then said; and from 10 till 11:30 they read. Then sext was recited; followed by dinner, which was over shortly after midday. The dinner, or *prandium*, consisted of vegetables, possibly eggs, perhaps fish, salad, bread and wine; but no meat was allowed. In Italy there followed a *siesta* or afternoon nap; but elsewhere the monks went to the fields, the shops, or the bakehouse and worked until vespers at 5 o'clock. Supper, or the *coena*, was at 5:30; then the reading of the "collations," and compline, and to bed at 6:30, often while it was still daylight.

We must distinguish "monks" from "friars" (from the French *frère*, "brother") though both are called Religious Orders, or "Regulars," as distinguished from the "Secular" clergy. Seculars are not bound by the vow of poverty as are Regulars; they follow no special rule, and may hold property as individuals. Retirement from the world and solitude are the essential characteristics of monks; hence it is that monasteries are located away from cities or towns in some secluded spot. Friaries

are usually found within or near city limits, as the friars engage in parochial and other ministerial work, and come in close contact with the outside world. Friars originally depended on alms or offerings of the people for their subsistence; hence the term mendicant (from the Latin *mendicare* "to beg") was formerly applied to them. The chief orders of friars are the Dominicans ("Black Friars"), the Franciscans ("Gray Friars"), Carmelites ("White Friars"), and the Augustinians.

Among these the Franciscans are perhaps the best known in American history, for it was the Spanish members of that order who founded the many early Indian missions in the New World, penetrating Arizona and New Mexico as early as 1539. (See Francis of Assisi.) The Dominican friars form a preaching and teaching order, with many communities in America.

It may be asked why men and women leave the world to enter a religious community. Briefly, a



The Carthusians, except on special occasions, eat but once a day and then of the coarsest food. To mortify the flesh they wear rough hair shirts. They live in separate little houses like the ancient monks of Egypt, and spend their time reading, praying, and laboring with their hands.

## THE VESPER HOUR AT THE MONASTERY



What poet could better express the serenity and quiet beauty of the monastic life than the camera has here done in this view of a venerable monk among the graves of the dead at the vesper hour in the Franciscan mission of San Luis Rey, California?



## THE LIFE OF TOIL AND PRAYER



Like the Benedictines, the Cistercians keep their time well occupied with toil, particularly as farmers and gardeners, both orders believing that idleness is a great source of evil.

Catholic believes they do so the better to practice the counsels given by Christ as set down in the Gospels—the renunciation of wealth, worldly pleasures, ambition or self-seeking, and the rendering of greater service to God and humanity. These are the motives which have induced and still induce multitudes to embrace the “religious” life.

In the early days of Christianity women vowed to the service of God lived in their own homes, and at a later period in community houses called *parthenones*. Not till the institution of monasticism did they live according to established rule. Thenceforth they are known as “Nuns” (from the French *nonne*, supposed to be derived from an Egyptian term meaning “virgin”). The nuns of Egypt and Syria cut their hair—a practice not introduced in the West till a later period. In the early Middle Ages there were many communities of nuns in France, Italy, Spain, England, and Ireland, whose organization was, with a few exceptions, similar to that of monks. Heading

## A CLUNIAC MONK



The order of Cluniac Benedictines was founded in 910. In place of the manual labor of the Benedictines, this order substituted prolonged church services.

each community was an “abbess,” who, like the abbot of the monasteries, had complete jurisdiction in matters of administration.

Those who enter a religious community, whether of men or women, must first become “postulants.” Then follows a “noviceship,” the period of which differs for various communities, but it must not be in any case less than one year. Following the novitiate comes the “profession,” which is either simple or solemn. At the solemn profession the religious takes the three vows of poverty, chastity, and obedience. Often the constitutions of an order add other vows inspired by its purpose. Thus the Poor Clares make a special vow of enclosure; the Minims make a vow of strict abstinence; the Carmelite sisters and “Discalced” (barefoot) Augustinians, a vow of humility; the Passionists, to promote devotion to the Passion of Our Lord; the Brothers of the Christian Schools, vows of stability and gratuitous education of children; the Little Sisters of the Poor, a vow of hospitality.

## MARVELS of the MONOTYPE and Its TYPE-CASTER

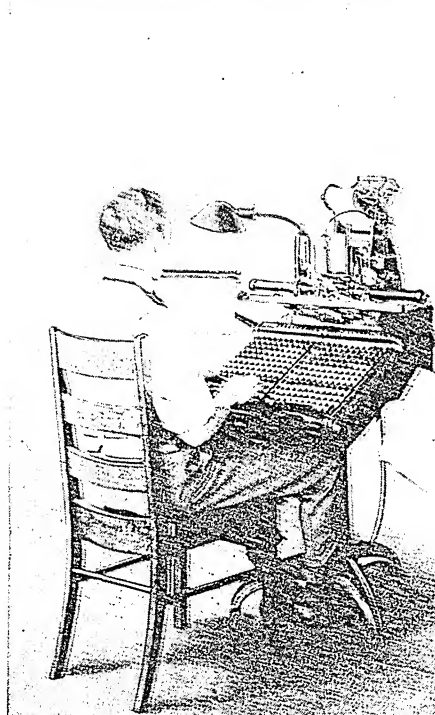


Fig. 1.—Monotype Keyboard

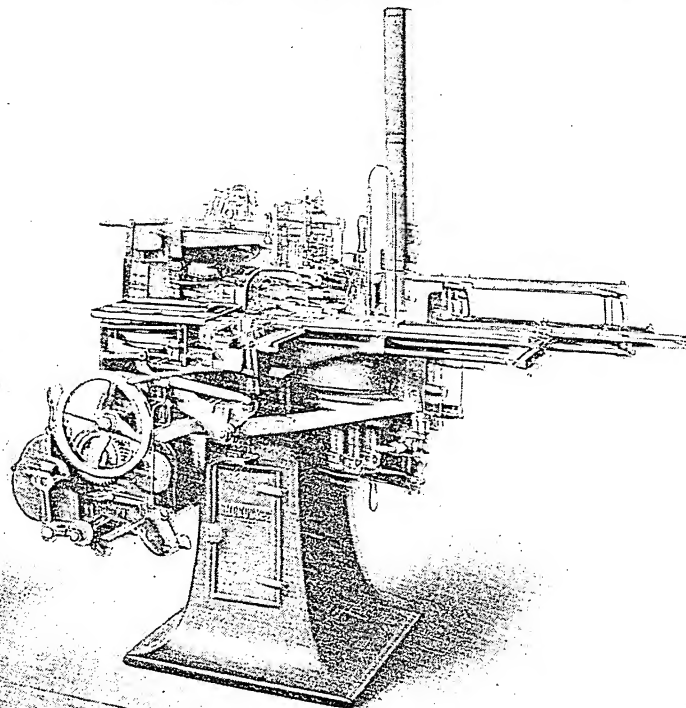


Fig. 2.—Monotype Casting Machine

**MONOTYPE.** To the patient monk in his "scriptorium," spending years in making a single copy of a book, printing from movable types must have seemed almost a miracle. How stupefied with amazement he would have been if prophetic vision could have shown him the monotype of today which produces thousands of type each hour—cast, set, and "justified" by nimble air-breathing machines operated by simply pressing the buttons on a keyboard.

Strictly speaking, the monotype is *two* machines—a keyboard "composing" machine and an automatic type-caster. At the keyboard of the "composing" machine (Fig. 1) an operator sits and punches a paper ribbon into a pattern of holes. This perforated ribbon, called the "controller paper," is the code of instructions to the caster. When the controller paper is inserted in the caster (Fig. 2), that knowing machine casts one type after another, with spaces of the proper thickness in order to "justify" each line to the given length; it assembles one line after another and delivers them on galleys the same as though the type had been set by hand—and all with less oversight than it takes to keep a gasoline engine pumping water on the farm. Unlike the linotype, which produces solid bars or "slugs" of metal, each having a line of type characters on its face, the monotype casts each character separately (*see* Linotype).

The monotype keyboard is somewhat like a giant typewriter keyboard. It has more than 260 keys

because, while the typewriter carries only two alphabets—one of capitals and one of small letters—the monotype carries five or more different alphabets. With those five alphabets on the keyboard, the operator can make controller papers that enable the caster to produce hundreds of different faces of type of various sizes.

Both keyboard and caster are controlled by compressed air. When you touch a key on the keyboard, a complicated system of valves, pipes, levers, and punches perforates the moving paper ribbon (*see* diagram, Fig. 3). Each key controls a particular combination of perforations, which is made by no other key; each set of perforations made by any key, therefore, stands for the character on that key and for no other, just as each dot-and-dash combination in the Morse telegraph code stands for one particular letter and no other. The monotype code, however, is one of position, like the code of letters and numbers that helps to find places on an indexed map; this you will understand better when we examine the caster.

One interesting feature of the keyboard deserves particular notice. This is the "justifying scale," the swinging cylinder above the keyboard, around which run row on row of figures. Printed matter, you know, must be "justified" or spaced so as to fill out each line and leave no ragged edges. When the operator nears the end of a line, a warning bell rings as it does on a typewriter. The operator looks at his

copy and finds, let us say, that his next word (one of six letters, like "pledge") cannot be divided, and he has not enough space to put it in. What does he do?

Ask rather what the machine does. The operator looks at the justifying scale; the space-pointer on it, which has been keeping tab on every letter, points to figures indicating the spacing that must be used to fill out the line. The operator presses the red spacing keys at the top of the keyboard as the pointer tells him; that is all. The caster, thus instructed by the perforation which this makes in the controller paper, will do the rest.

Fig. 3 shows how the "controller paper" of the monotype receives its perforations. When a key is pressed the valve-bar opens an air valve, and by means of the piston, lever, and punch, one or more holes are made which stand for that letter or character. Those perforations then become the instructions to the automatic caster to cast that type or character. In the picture parts of this wonderful machine are removed in order to make clear the principle on which it operates. For instance, only one of the two keyboards appears, so you can see the inside.

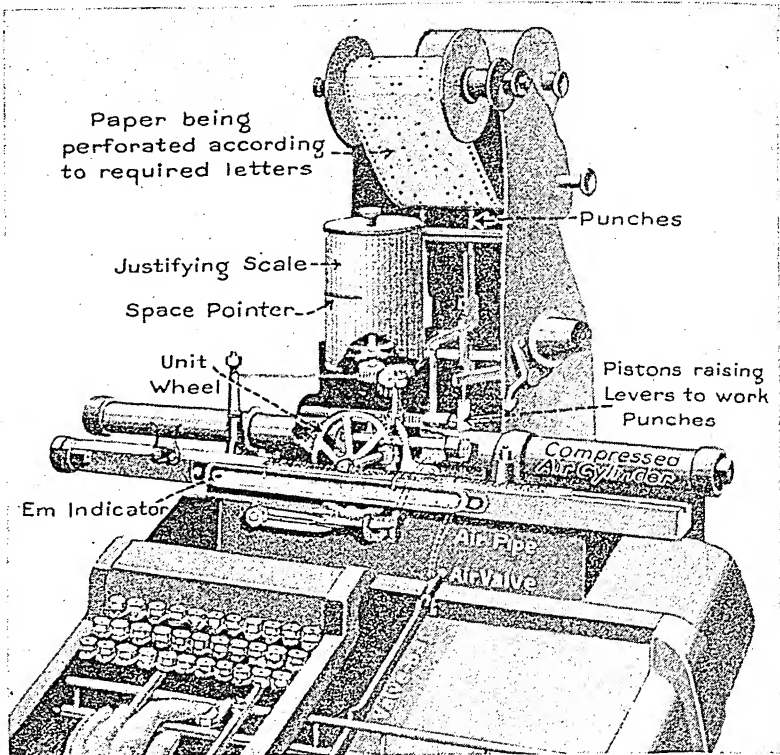


Fig. 3.—How the "Controller Paper" is Perforated

Now let us look at the caster diagram (Fig. 4). It consists essentially of the following parts: (a) a pot of molten metals heated electrically or by a gas flame; (b) above the melting pot, a mold for a single type into which the molten metal is driven at the right instant by a pump; (c) face down over the mold, a matrix case (Fig. 5) in which are locked 225 matrices in which the faces of the type are formed; and (d) a compressed air supply, with outlet valves which control the mechanism that does the casting.

When the perforated controller paper is placed in the caster, and the machine is set going, what happens is briefly this. Each set of perforations in the paper, as it comes opposite the row of holes in the air cylinder, releases air into little tubes or pipes, and by a marvelous system of pin-blocks and rods the matrix case is instantly shifted so that the matrix for the corresponding letter or character is brought directly over the type mold. As soon as this is centered over the mold, molten type metal is forced by the pump-plunger into the mold, and the type is cast. Automatically the width of the type-mold alters with the size of the letter to be cast, so that a capital letter M, for example, will

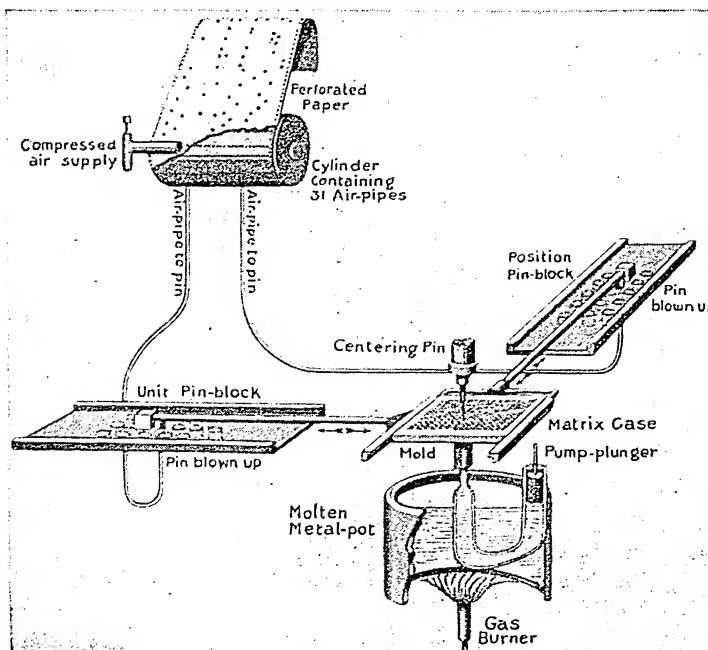


Fig. 4.—How the Monotype Caster Works



have a wider body than an I. The operation of adjustment and casting is repeated as each new combination of perforations passes over the compressed air outlets. By an exceedingly ingenious arrangement the spaces between the words in each line are cast thicker or thinner, as a result of the spacing indications, so that each line of type when completed exactly fills the page or column measure.

Figure 4 shows clearly how the monotype caster performs this marvelously ingenious work, clicking out finished type, perfectly cast and "set" in proper order, faster than one can count. Com-

pressed air is released through the row of holes in the cylinder into a series of air pipes, which connect with the two groups of pin-blocks. By one series the matrix case is moved so many spaces to the left or right; by the other, at the same time, so many spaces forward or back. Thus the case is held in position above the mold to form the letter called for by the perforated instructions on the controller paper. Up wells the molten metal in the mold, impelled by the pump; down bites a centering pin holding the matrix case firmly over the mold just long enough for the liquid metal to solidify—which is not nearly so long

as it has taken to say all this. In another instant, the mold opens and out glides the perfect type to be assembled with its predecessors, while the machine goes on at the rate of 150 castings a minute. This diagram shows only two of the air pipes, and of course omits much else in the complicated machine in order that the principle on which it operates may be made clear.

So entirely independent are keyboard and caster of each other that a keyboard in New York or San Francisco may prepare a controller ribbon from which a caster in Chicago or New Orleans may cast and set

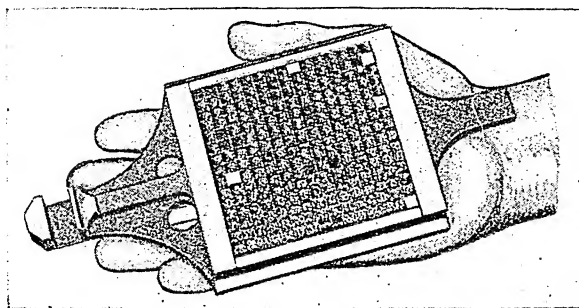


Fig. 5.—Matrix Case

type—and set it just as well as if the two machines were in the same room. And because the monotype, like the hand compositor, sets movable type, its work may be corrected or altered by hand, letter by letter, instead of having to be reset like linotype work.

This wonderful machine—in many respects more wonderful even than the linotype—was invented and patented in 1887 by Talbert Lanston, for many years a clerk in the Pension Office in Washington, D.C. It is not so well suited to the work of daily newspaper offices as the linotype, but it has a wide field in book, magazine, and general job printing.

## *The PRESIDENT Who Said to Europe: "HANDS OFF!"*

*How James Monroe, Author of the Famous Monroe Doctrine, Won His Way to the White House—His Lifelong Devotion to Jefferson and His Quarrel with Washington—A Man "Without a Blemish"*

**M**ONROE, JAMES (1758-1831). As the president who first announced the principle known as the "Monroe Doctrine," James Monroe, fifth president of the United States, holds an important place in American history. The idea of the doctrine that "America is for the Americans" did not however originate with Monroe. Washington, in the wars between England and France, had publicly warned the nation to "beware of entangling alliances," and Jefferson had privately declared, "The day is not far distant when we may formally require a meridian of partition through the ocean, on the hither side of which no European gun shall ever be fired, nor an American on the other." It was left to Monroe, however, to make this doctrine of "hands off" for Europe a matter of official record by incorporating it in a message to Congress in 1823. (See Monroe Doctrine.)

Although the Monroe Doctrine is still part of the United States' foreign policy, the man Monroe is little known, and his other achievements almost forgotten. He was tall, but so inclined to stoop that he

looked less than the six feet which were actually his. His features were rugged and his awkwardness and shyness added to the unfavorable impression that he made. He never overcame this appearance of timidity.

Monroe's education was rather deficient. His family, of Scotch and Welsh descent, belonged to the class of small planters of western Virginia, and he had just entered William and Mary College, at the age of 16, when the Revolution broke out. With a number of fellow-students and professors he at once left school to enter the army. Though Washington speaks of him as a brave officer, he failed to secure promotion beyond the rank of lieutenant-colonel, and during much of the time he did not see active service.

In 1780 Monroe left the army and entered upon the study of law under Jefferson, then governor of Virginia. Here began the friendship which lasted until Jefferson's death, and which greatly influenced Monroe's career. In writing to Jefferson he once said, "I feel that whatever I am at present in the opinion of others, or whatever I may be in future, has greatly arisen from your friendship."

Monroe was in turn a member of the Virginia assembly, of the United States Congress under the Articles of Confederation, of the state convention which ratified the Federal Constitution, and of the United State Senate under that constitution. He was successively minister to France, Spain, and England, governor of Virginia for several terms, secretary of state and of war under President Madison, and finally was the fourth Virginian out of the first five presidents to hold the highest office in the American republic.

In the Virginia convention of 1788 Monroe, along with Patrick Henry and Richard Henry Lee, opposed the ratification of the Federal Constitution. He feared lest the United States might become a monarchy and he fought the Constitution until amendments were promised which he thought necessary to safeguard the rights of the people. In the United States Senate, when appointed as one of Virginia's first representatives in that body, he allied himself with Jefferson's party in favor of "strict construction," and opposed Hamilton's measures which were intended to strengthen the national government.

Nevertheless, as his party was friendly to France, Washington sent Monroe as minister to that country in 1794, where he arrived a short time after the fall of Robespierre. Even the excesses of the Reign of Terror did not cool Monroe's ardor for the Revolution. Unfortunately he allowed his partisan feelings to carry him so far as to say in a public address in Paris that the treaty which John Jay, under Washington's direction, had just concluded between the United States and England was "the most shameful transaction I have ever known of the kind." For this and other indiscretions he was recalled in disgrace. When he returned to America he published a justification of his conduct in a pamphlet entitled 'A View of the Conduct of the Executive in the Foreign Affairs of the United States', in which he severely criticized Washington. Though

the president took no notice of the pamphlet at the time, it is said that he never forgave Monroe for this unwarranted attack.

In 1803 Monroe went to France a second time, sent by Jefferson as a special minister to aid in the negotiations which led to the purchase of Louisiana. After that memorable purchase was completed he went to Spain to try to buy the Floridas also, but in this negotiation he was unsuccessful. As minister to Great Britain he negotiated a treaty in 1806, but this was rejected by President Jefferson, who refused to lay it before the Senate because it contained no provisions against imprisonment and interference with the rights of neutral ships.

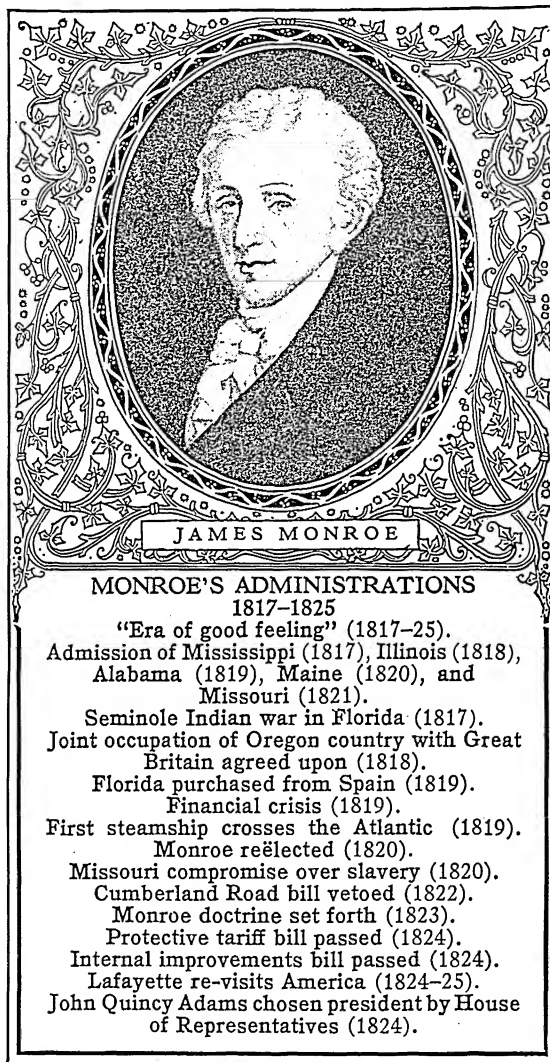
During the War of 1812 Monroe served under President Madison as secretary of state, and also for a time as secretary of war. The city of Washington was burned by the British during the time that Monroe acted as secretary of war but his measures as a whole won him popularity, and his position as secretary of state put him in line for the presidency.

In 1816 Monroe reached the pinnacle of his career when he was elected to succeed Madison as president, with Daniel D. Tompkins of New York as vice-president. Monroe's vote in the electoral college was 183, to 34 cast for

Rufus King, the Federalist candidate. Monroe and Tompkins were reelected almost unanimously in 1820; the one vote cast against him at that time is said to have been "so that no one might share with Washington the honor of a unanimous election."

During Monroe's administrations he still displayed his interest in expanding the territory of the United States. He was successful in purchasing the Floridas from Spain in 1819, and by the successful prosecution of a war against the Seminole Indians he opened up that new region to settlement.

But expansion brought new and troublesome questions with it. If the people occupied an extensive territory, better means of communication were nec-



essary. Monroe was interested in seeing these secured, but as a strict constructionist he believed that Congress did not have the power to provide them. Consequently he vetoed a bill providing for internal improvements. A more important question in regard to the new territory was whether slavery should be allowed in it. The problem was temporarily settled in 1820 by the Missouri Compromise, but it was not finally decided until slavery was abolished at the close of the Civil War. (See Missouri Compromise.)

The period from 1817 to 1825, during which Monroe was president, has sometimes been called the "Era of Good Feeling," because there was only a single organized political party during that interval. There were, however, so many personal factions, each of which desired to see its leader president, that the election in 1824 has been called the "scab race for president." The "Era" was also marked by the second visit of Lafayette to the United States.

With the inauguration of John Quincy Adams in 1825, Monroe retired to private life after a public career covering more than 40 years. During that time he had displayed no wonderful ability as legislator, diplomat, or executive; but he had proved an honest and patriotic citizen, whose motives were never questioned even by his enemies. Jefferson well said of him that "he is a man whose soul might be turned wrong side outwards without discovering a blemish to the world." His closing years were harassed by debt, and he removed from Virginia to find a home with his son-in-law, in New York City, where he died on July 4, 1831.

**MONROE DOCTRINE.** What is known as the "Monroe Doctrine" is not a part of international law, or even of the law of the United States. It has, however, formed the basis of American foreign policy for over a hundred years. It was the outgrowth of an early principle of American diplomacy—the complete political separation of Europe and the Americas, which had been urged by Washington, John Adams, and Jefferson. Many diplomatic notes have been exchanged over it and the United States has even stood ready to fight for it on occasion.

#### Monroe's Famous Message

The basis of the Doctrine is found in two declarations of President Monroe's message to Congress, Dec. 2, 1823, which were aimed at two troubling foreign situations.

Russia at that time planned to establish a colony on the Pacific coast, and in 1821 had forbidden foreign vessels to approach the northwest coast. There were also suggestions that the "Holy Alliance" of European powers which had just put down revolutions in Italy and Spain should interfere forcibly in Latin America to reestablish Spanish rule over her colonies which had declared their independence.

This last proposal was opposed not only by the United States but also by Great Britain. The British foreign minister wished the United States and England to make a joint protest, but John Quincy

Adams, then secretary of state, thought it better that the United States should make an independent declaration. With the advice of President Monroe, he formulated most of the contents of the Monroe Doctrine.

The first declaration was a warning to Russia that the American continents "are henceforth not to be considered as subjects for future colonization by any European powers." The second warned the allied powers of Europe—France, Prussia, Russia, and Austria—that "any attempt on their part to extend their system to any portion of this hemisphere" would be considered "as dangerous to our peace and safety." It was further stated that we could not view "in any other light than as the manifestation of an unfriendly disposition toward the United States" any attempt to oppress or control the destiny of governments whose independence we had recognized.

#### The Doctrine Proves Effective

The declaration had the desired result. Although it was necessary to call attention to the principles embodied in the Doctrine several times, no serious European interference on this continent was attempted until 1861 when Napoleon III tried to place Maximilian, an Austrian prince, upon the throne of Mexico. The United States was just entering upon the Civil War, but she made an immediate protest to France. As soon as peace was restored in 1865, she sent troops to the Rio Grande frontier, insisting upon the removal of the French army. Another notable application of the Doctrine was in the boundary dispute between British Guiana and Venezuela, 1895, when the United States succeeded in bringing about a settlement by arbitration.

In 1902, during Theodore Roosevelt's administration, a revolutionary government in Venezuela disregarded its obligations to investors in England, Germany, and Italy. When diplomacy failed, these nations threatened forcible redress, but the United States induced them to arbitrate. In his message to Congress in 1904, President Roosevelt maintained that in "flagrant cases of wrongdoing" by Latin American republics, the United States had the right to exercise an "international police power" over them. The policy of the "Big Stick," as it was called, caused the United States frequently to intervene in Latin American affairs. This extension of the Monroe Doctrine was resented by Latin Americans as an infringement of their sovereignty.

Successive administrations widened the scope of Monroe's original declarations. The warning addressed to Europe alone became applicable to all non-American powers, and the restriction of further colonization became an objection to the transfer of any territory in the New World. The Doctrine in this form has been invoked on several occasions, with overwhelming popular support in the United States.

The general tendency of American statesmanship in recent years has been to convert the Monroe Doctrine from a guarantee by the United States to a statement



of principle on the part of all the American republics. Under President Franklin D. Roosevelt's "good neighbor" policy, the United States signed a treaty with Latin American countries in 1933 agreeing that "no state has the right to intervene in the internal or external affairs of another."

As a result of this policy, the Monroe Doctrine has been changed from a one-sided affair, defined and enforced only by the United States, to a continental doctrine, with all American nations agreeing to defend Pan American security. This interpretation emerged from a series of Pan American conferences—at Buenos Aires, in 1936, convened and personally attended by President Roosevelt; at Lima, in 1938; and at Havana, in 1940. At this last conference the foreign ministers of the 21 republics approved a plan for joint administration of any European possessions in the Western Hemisphere threatened with transfer to the control of another non-American power. (See also Latin America; Roosevelt, Franklin D.)

**MONTAIGNE** (*môn-tân'*), MICHEL EYQUEM DE (1533–1592). This famous French essayist seems more nearly to be "all things to all men" than almost any other French writer. People of every nation, people of every sort of disposition and belief, have read his essays for the past 300 years, more and more of them every year. Therefore we may be assured that he did not take sides heatedly about most matters, nor create any new and set way of writing which might please some and not others. His essays flow along as clearly and naturally as water, and are as widely refreshing, always whimsical, full of the amusing twists of Montaigne's mind. He found himself very funny. He would write, in these essays which people still like so well, of his own clumsiness, of how he could not harness a horse or carve a roast or fold a letter, and what a task he found it to tell lettuce from cabbage in his garden. Those are things about which all the world may smile, but not argue. Many a time he states ideas much more complicated and serious

than his troubles with harnesses or cabbages, but always with suavity, openness to another's ideas, musing gentleness—sometimes even with a sly and cynical smile. But he attracts all men to fish for themselves, in silence, from the lovely waters of his great stream of essays, and nobody wrangles about Montaigne, any more than they would shout beside a trout stream.

Montaigne's training and life were extraordinary, and we perceive him, always dressed in plain black, as a lonely, rather bitter, eccentric, and even crotchety figure. Yet he could mourn half his life for his one great friend, Étienne de la Boetie; and in his eye occasionally flamed a light such as that which shamed and drove away a scoundrel and crowd of ruffians who had marched into his house to plunder it.

When Montaigne was a baby he was nursed by a poor woman in a village, as his father wanted him to feel sympathy for the poor. And we ourselves may still feel sympathy for the poor of this same village, who were all obliged to learn Latin that they might always speak that tongue to the little Montaigne, and thus make it easy for the child to learn a language which was considered the foundation of education! The boy was also awakened always to the sound of music. Is it strange that he grew up to be a highly trained, refined, and singular man?

He loved solitude, and had a tower built on his house, where he worked, and where he even had a little chapel and heard mass all alone. Not even his wife was allowed in his tower. Indeed, Montaigne had no very high opinion of the intelligence of women. And a mocking Fate so arranged it that his six children were all girls, and it was a young woman admirer, Marie le Jars de Gournay, to whom he confided his last literary ideas, and who therefore became editor of his essays after his death, revising them in accordance with notations which he left. The first two books of his essays appeared in 1580 and the third in 1588.

## MONTANA, STATE of TREASURE and OPPORTUNITY

**M**ONTANA. Texas and California are the only states of the Union larger than Montana, which has an area nearly three times as great as the state of New York. The mountains and forests in its western part would almost cover Ohio; the farm lands of its plains and valleys are almost equal in size to Minnesota; and Delaware and Maryland could be placed upon the vast grazing fields in the east. The beautiful Glacier Park in the northwest, one of the most interesting of national reservations, is in itself larger than the state of Rhode Island (see Glacier National Park).

*Extent.*—North to south, 318 miles; east to west, 546 miles. Area, 147,138 square miles. Population (1940 census), 559,456.

*Natural Features.*—Rolling plains in east (elevation, 2,000 to 5,000 feet); Rocky Mountains (highest point, Granite Peak, 12,850 feet) in west. Principal rivers: Missouri and its tributaries (Yellowstone, Musselshell, and Milk) in the east; Clark Fork of the Columbia and its tributaries (Missoula and Flathead) in the west. Flathead Lake; Glacier National Park. Mean annual temperature, 43°; mean annual precipitation, 15".

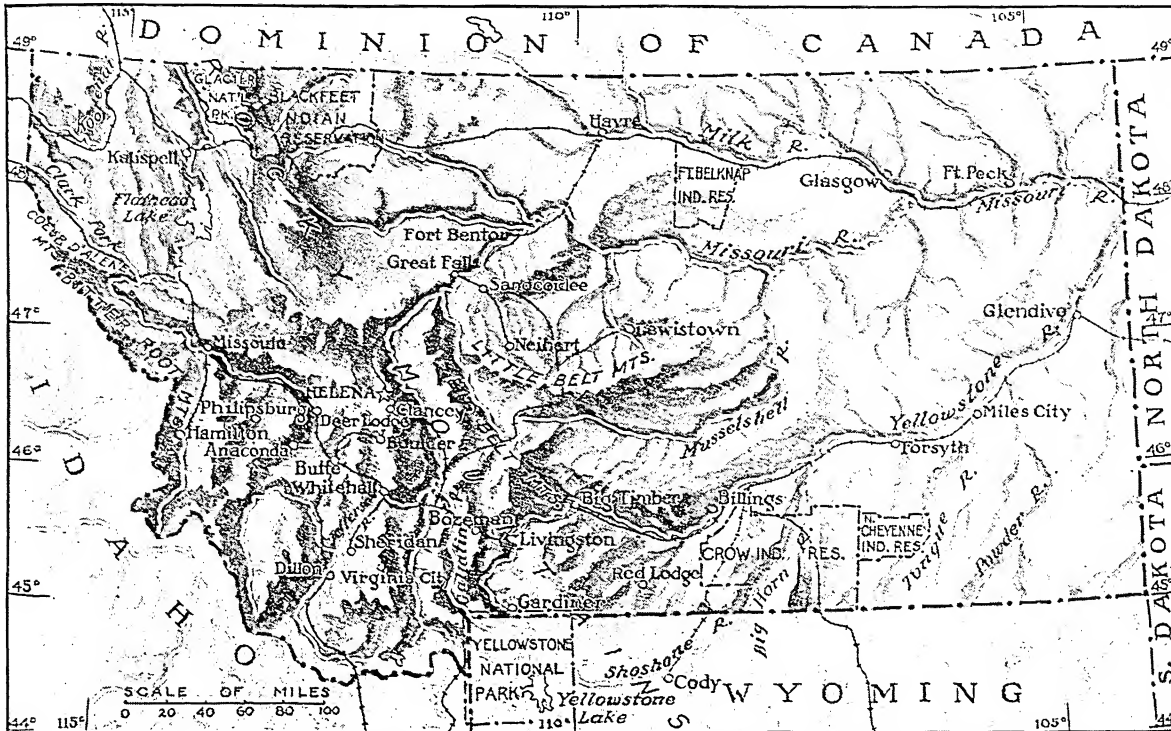
*Products.*—Wheat, hay, oats, barley, flaxseed, potatoes, beans; cattle, dairy products, sheep, wool, hogs, horses, poultry; copper, zinc, lead, silver, coal, gold, petroleum; flour and mill products, lumber products, railroad cars, petroleum refining, meat packing.

*Cities.*—Butte (37,081), Great Falls (29,928), Billings (23,261), Missoula (18,449), Helena (capital, 15,056), Anaconda (11,004).

The name "Montana"—from a Latin word meaning "mountainous regions"—describes a large part of the state. If we could stand upon the summit of one of the lofty peaks and look about us, we should see at first nothing but a riot of

rocky pinnacles shooting out of interminable forests; then out of the chaos would come stretches of grassy plains, a glint here and there of a shining lake, and dark canyons cut by roaring cataracts. This is part of the great roof of the continent, from which waters are carried to three oceans—the Arctic, Pacific, and Atlantic.

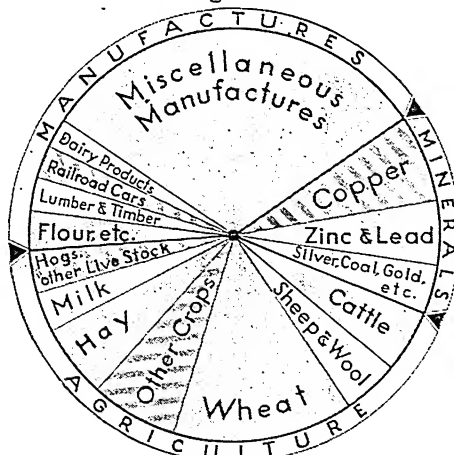
MINING, AGRICULTURE, STOCK RAISING—ALL PROSPER HERE



In the mountainous western part Montana is a vast treasure house of minerals—silver, copper, and coal. The rolling foothills of the eastern half support famous stock-ranges and rich farms. Metals and metal manufactures comprise nearly half of the total value of the state's yearly products. Wheat leads in farm products, followed by cattle and dairy products, sheep, wool, and horses.

It is not impossible that a group of men traveling through Montana in 1850 might have failed to see a single other white man. But discoveries of gold were made during the next 12 years, and those made after 1860 attracted thousands of eager prospectors into the state; cities grew up in a few weeks, and the first era of Montana's prosperity was begun. Helena sprang into being with the discovery of "Last Chance Gulch" in 1864, and many other mines of great richness gave rise to other towns. Silver-lead ores were next developed. In a few years, however, gold and silver production began to decrease rapidly, and many of the old town sites were abandoned. Then, not far from Butte, a straggling village which had once been a prosperous silver camp, a great discovery was made. In 1882 Marcus Daly, a shrewd miner, in sinking a great shaft at Anaconda, discovered a rich copper ledge, and his success gave

rise to an industry which has since led all others in Montana. Ore was found at other places in the Butte district in seemingly inexhaustible quantities,



Here we see the relative value of Montana's leading products, and the comparative number of people in various occupations.

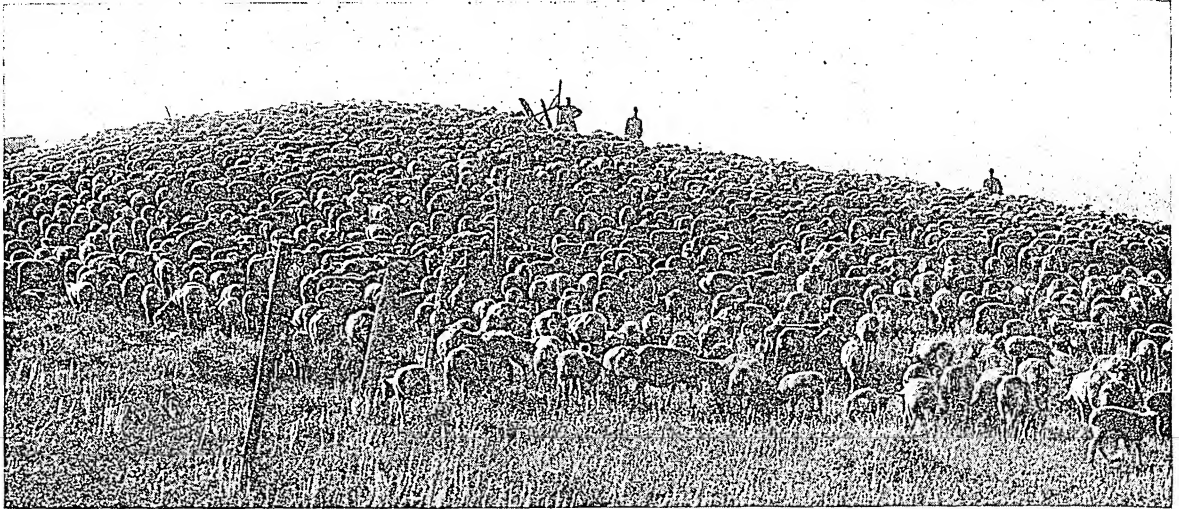
AGRICULTURE
MANUFACTURING
TRADE AND TRANSPORTATION
MINING
OTHER OCCUPATIONS

and Butte became the greatest copper-mining camp in the world. Hundreds of miles of tunnels honeycomb the ground beneath it, making a subterranean city where men work day and night, endlessly pouring forth the earth's treasure; while in the city above, vast plants for smelting and refining copper give work to many men. In the Beartooth Range near the southern border, the world's largest

chromite mine was developed in 1942 to provide the United States with the chromium formerly imported from the Orient, the West Indies, and Africa.

Zinc has become one of the most important minerals through the introduction of the electrolytic process of refining. Though the state has enormous high-grade coal and lignite deposits, production has as yet

## "OCEANS" OF SHEEP ON MONTANA'S ROLLING HILLS



Years ago Montana was the land of the cowboy, and great herds of cattle, trailed from the far southwest, roamed its hills, growing fat upon the abundant grass. Today much of the old "open range" has been turned over to sheep. Vast flocks guarded by "herders"—in the West they are never called "shepherds"—have to a great extent dispossessed the cattle, for cattle will not graze where sheep have been pastured.

hardly begun. Over a period of 75 years Montana has produced more silver than any other state except Colorado. Its manganese reserves are the nation's largest. In precious stones, chiefly sapphires, it also leads the nation. Gold, petroleum, natural gas, and lead are important.

### Products of Farm and Orchard

Vast herds of buffalo fattening on the rich wild grasses of the plains pointed out to the early settlers a more certain source of wealth than mining. Cattle raising soon became a great industry. Stockman and cowboy shared with the miner the task of founding the state. Sheep raising increased until Montana today is second only to Texas in the number of its sheep and the volume of wool production.

After 1900, homesteaders poured into the state, and farming soon became more important than mining. Wheat alone occasionally exceeds the total mineral production in value. Corn and hay are the other leading field crops. The irrigated areas produce excellent potatoes, beans, peas, and sugar beets. The mild valleys west of the Continental Divide grow cherries, apples, and other fruits and berries. About 1½ million acres are under irrigation. This is little more than one per cent of the total arable land, but the irrigated area is increasing. The Fort Peck Dam, designed for irrigation, power, and to aid navigation, is the largest earth dam in the world (*see Dam*).

Because Montana has no large local markets for its produce, most of it consists of things that can be shipped profitably over long distances. Almost three-fourths of the farm income is from the sale of wheat, cattle, sheep, and wool.

### The Leading Industries

Copper smelting and the manufacture of copper products make up the chief industry. Petroleum refining has increased rapidly and now takes second

place in value of products. Refined beet sugar is the most important manufacture based on agriculture, followed by flour, butter, meat, cheese, and powdered milk. The great forests yield lumber and pulpwood.

Nearly 1½ million tourists each year find recreation in Montana's beautiful mountains and national forests and on its "dude ranches." They spend from 25 to 30 million dollars annually, and constitute an important source of income for many of the state's people.

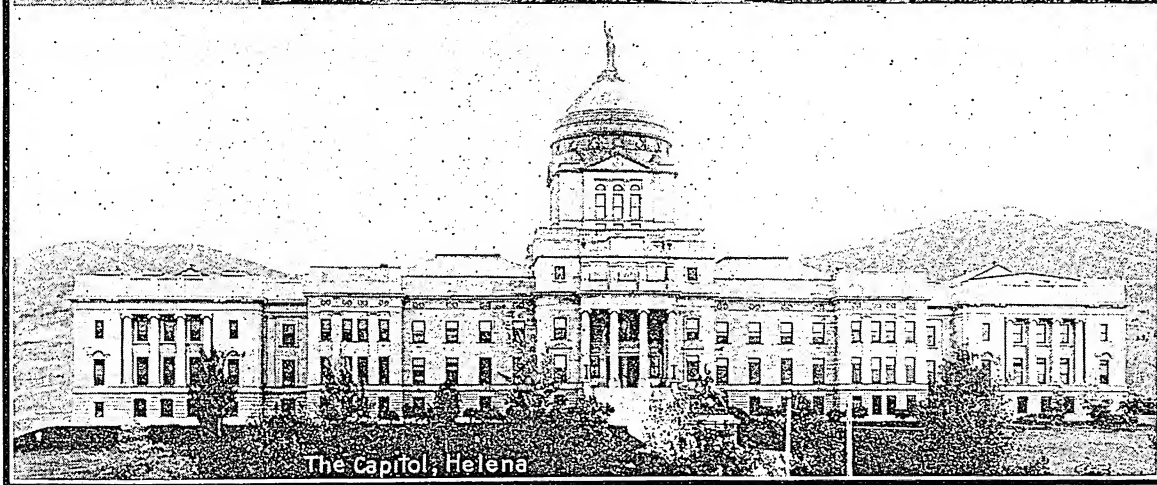
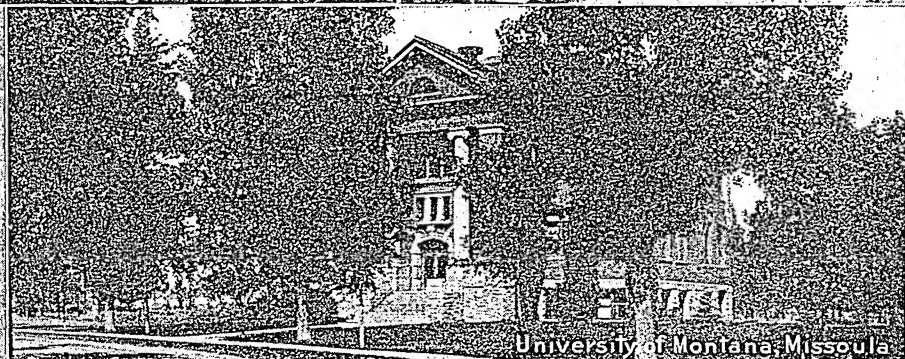
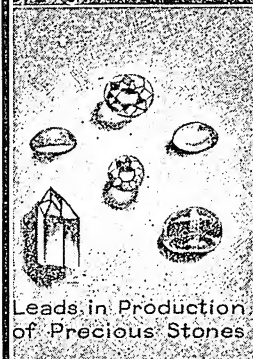
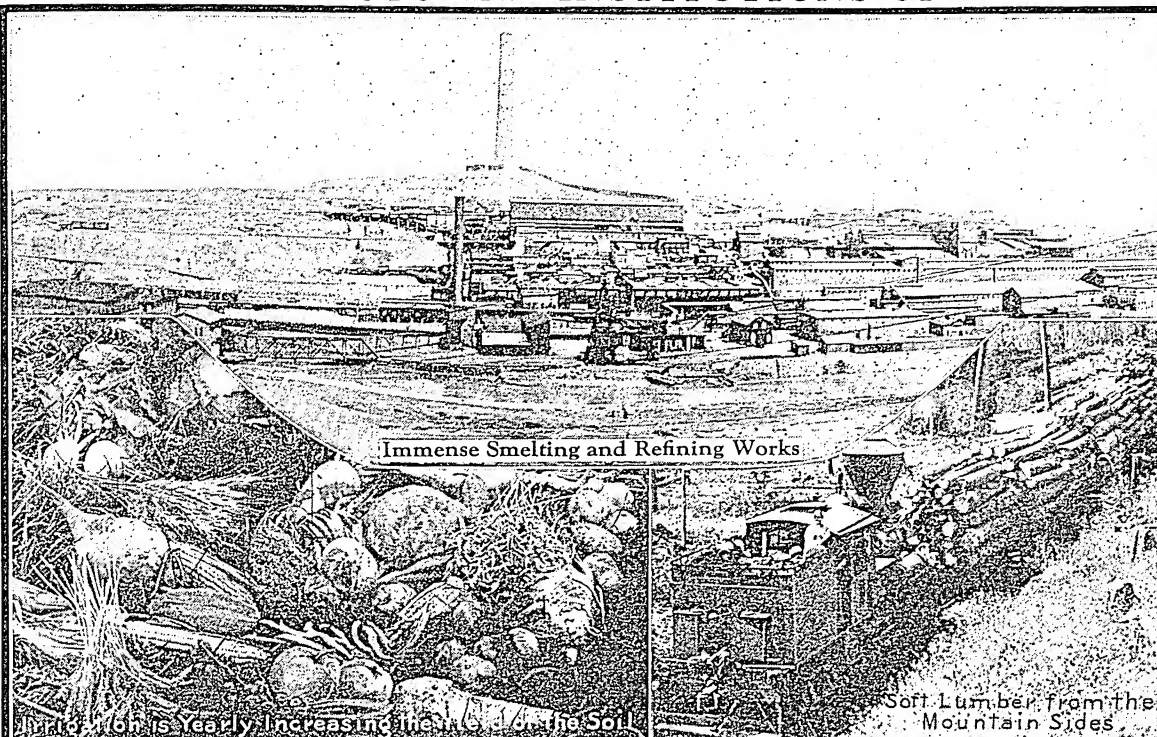
### Great Variety of Climate

The great size and varying altitudes of the state give it a diversified climate. The eastern section belongs to the Great Plains region—gently rolling or level land broken by the deeply eroded courses of the Yellowstone and Missouri rivers and their tributaries. A few isolated mountain groups stand above it like islands. The plains rise from an elevation of 2,000 feet in the east to 4,000 feet at the foothills of the Rockies. Temperatures are extreme in this area. The highest recorded temperature is 117°, the lowest -65°. Rainfall averages from 10 to 15 inches a year. The isolated mountain groups get more moisture, with frequent local thundershowers.

The western section of the state is crossed from northwest to southeast by parallel ranges of the Rocky Mountains—the Bitterroot, Absaroka, Beartooth, Kootenai, and other mountains. Some of their peaks reach almost 13,000 feet. Winters are more moderate, summers cooler, and rainfall heavier than in the semi-arid east. The climate as a whole shows great changeability. Sudden fierce storms from the north may be followed by warm, dry chinook winds from the southwest. The results, however, are very healthful. The story is told of a Montana real estate agent who was boasting to a "tenderfoot" of the climate when they suddenly came in sight of a little cemetery. "How is that?" said the prospective buyer. "I thought you



# LEADING PRODUCTS AND INSTITUTIONS OF MONTANA



These pictures speak for themselves. But there is one interesting point you might not notice. See the huge smokestack of the copper smelter rising high up on that hill, far removed from the works? Well, you must know that smelter fumes are poisonous to vegetation and bad for human beings. The stack is situated in that way so the smoke will spread out and become diluted with air before it reaches the ground and so do as little damage as possible.

said no one ever died out here." "Oh," said the land boomer, "that is the family of a fool doctor who moved in here and his family starved to death."

By far the largest of Montana's cities is Butte. In the daytime it seems like a great mining camp set down in a modern city, but at night with its lights shining from all the hillsides it seems a bit of wonderland. Here is located the State School of Mines. Helena, the capital, is a city of beautiful homes, picturesquely situated amid the Rocky Mountains, with splendid roads leading from it in all directions to scenic points. It is the seat of Carroll College for men. The city serves the surrounding mines, farms, and cattle and sheep ranches as a supply center. Brick, tile, and cement pipe are manufactured.

Great Falls, the second city in the state, derives its commercial importance from the power furnished by several falls of the Missouri River. Billings, the largest city in the eastern part of the state, is a railroad and distributing center for a rich agricultural and grazing region.

Missoula, the "Garden City," is situated at the junction of three valleys. Farming, fruit growing, lumbering, and mining are the chief activities of the surrounding country, and the city has lumber mills, railroad shops, a beet-sugar factory, and an oil refinery. It is the seat of the State University of Montana. This institution and the Montana State College of Agriculture and Mechanic Arts at Bozeman, the Montana School of Mines at Butte, the Montana State Normal College at Dillon, the Eastern Montana Normal School at Billings, and the Northern Montana College at Havre make up the University of Montana.

Anaconda, 26 miles from Butte, is noted for its copper-smelting works. Among its other industrial establishments are railroad and machine shops, foundries, and brick works. In its vicinity are found deposits of gold, silver, lead, and sapphires. The city has also a large state fish hatchery.

It was not until after the United States had acquired Montana in 1803 as a part of the Louisiana Purchase that an authentic account of it was obtained. Lewis and Clark with their band of followers explored the country in 1804-05, and were among the first white men to set foot within its borders (see Lewis and Clark Expedition). For more than 50 years thereafter few people save trappers and Indian traders visited the territory, which remained a vast and almost unknown wilderness until the discovery of gold in the 1860's. In 1864 Montana was organized as a separate territory and in 1889 was admitted to the Union. In 1876 Gen. George Armstrong Custer, with his command of 208 United States cavalrymen, met a tragic end on the Little Big Horn, being massacred to the last man by the 6,000 Sioux warriors who had risen in rebellion under Sitting Bull.

The present population is a cosmopolitan mixture from almost every state in the Union and Canada. A disappearing element are the early settlers from Missouri and the border states who came about the

beginning of the Civil War. There are nearly 17,000 Indians in the state, the majority being located on six reservations.

**MONTCALM**, MARQUIS LOUIS JOSEPH DE (1712-1759). The name of Montcalm, the commander of the French troops in Canada during the French and Indian War, is inseparably linked with that of Wolfe, the British commander, as they were the two principal actors in that most spectacular drama which decided that North America was to be chiefly English-speaking and not French, and that it was the self-governing institutions of England that were to prevail and not the absolutism of France under the Old Régime. Though Montcalm suffered defeat and death in the conflict, his name stands as high in the opinion of posterity as does that of Wolfe, his conqueror. In Quebec today there stands a monument to the two heroes, bearing this inscription in Latin: "Valor gave them a common death, history a common fame, and posterity a common monument."

Montcalm had entered the army of France at the age of 14, and risen to the rank of colonel by the time he was 24. Ten years later he was sent to America, with the rank of brigadier general, to command the French troops in that theater of the world-wide war with the British. He won victories at Oswego, Fort William Henry, and Ticonderoga. But at Quebec Wolfe proved himself the better general, and the French were defeated on the Plains of Abraham, west of the city. Montcalm, as well as Wolfe, was mortally wounded during the battle; when told that he could not live, he replied: "Thank God! I shall not live to see the surrender of Quebec."

**MONTE CARLO** (*mōn'tē kār'lō*), MONACO. The picturesque resort of Monte Carlo, on the Mediterranean coast near where France and Italy meet, has been supported by gambling since the middle of the 19th century. Cards, roulette, and other games have paid for the splendid buildings, gardens, and lawns that look out from a promontory high above the sea.

The most splendid building of all is the Casino or gambling hall, with gleaming white walls, tiled roofs, and luxurious salons. Men and women from all over the world—royalty, the rich, and the venturesome—have gathered here each night. They have crowded about the roulette tables at the *croupier's* signal: "*Faites vos jeux, messieurs!*" ("Make your plays, gentlemen!"). They have tried their luck at the card games, *trente et quarante*, *écarté*, *baccarat*, and many others. They have excitedly placed bets on the miniature horse race, *les petits chevaux*.

In some of the games, the stakes were set at thousands of francs, and many gamblers bet beyond their means. Despair and death have followed a spin of the roulette wheel or the turn of a card.

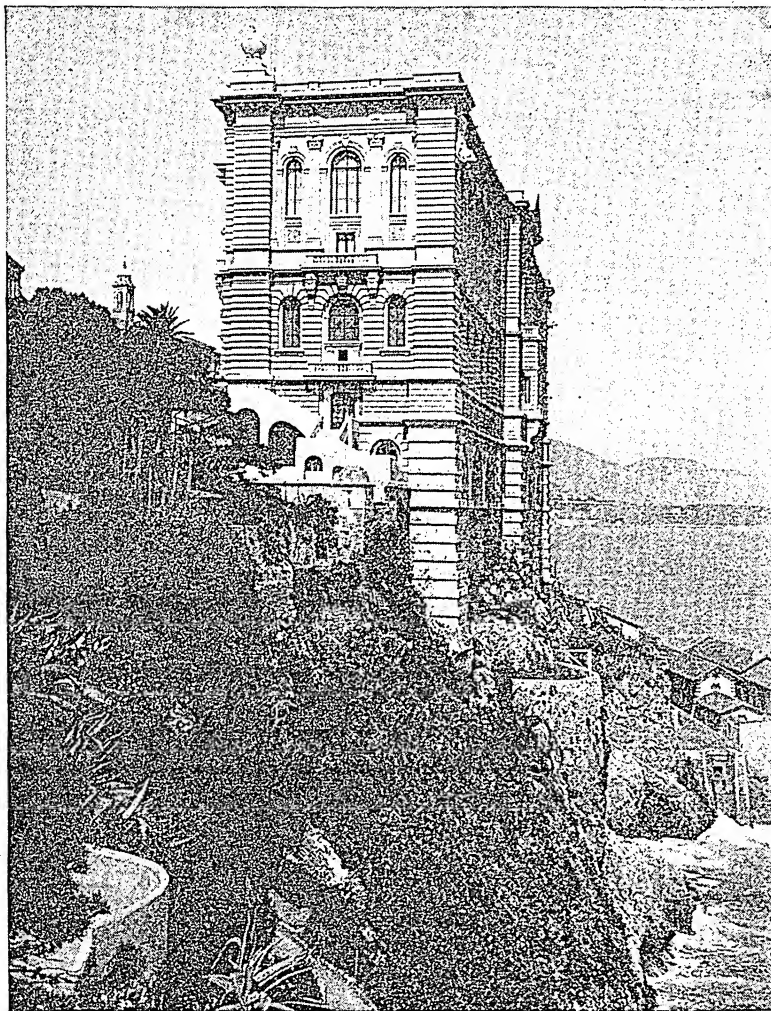
The Casino with its wide terrace fronting the sea has been the center of the life of the little city, with its long street of Parisian shops and many little tea rooms. Monte Carlo and two other towns, all melting into one another, cover practically all of the terri-

tory of the independent principality of Monaco, ruled by the Prince of Monaco. His tiny realm, dotted with lovely gardens and magnificent villas, occupies the very fringe of the foot of the Alps and two promontories. Its area is somewhat less than 370 acres. The gambling privileges yield so large a revenue that no taxes are paid by the people of the

miles away; to the east, across the Bay of Monaco past Cap Martin is the frontier of Italy. The population of Monte Carlo is nearly 10,000; of the principality of Monaco, about 23,000.

**MONTENEGRO.** As the smallest independent kingdom in Europe, and the only portion of the Balkan peninsula which was never really subjugated

#### OVERLOOKING THE BLUE MEDITERRANEAN



Monaco is famous in the scientific world for its magnificent Oceanographic Museum, pictured above. Opened in 1910, it was built by Prince Albert to house the exhibits which he spent a lifetime in collecting. His researches on the Gulf Stream, ocean currents, and marine fauna won him a membership in the French Academy of Sciences. The building stands on a rocky promontory at the tip of the mainland.

principality. None of the prince's subjects are allowed to play at the gambling tables.

The town of Monaco, within its ancient battle-mented walls and bastions, is reached by a tramway or by climbing long flights of steps through winding streets. It centers about the palace of the Prince of Monaco, near which stand the cathedral and a remarkably fine museum of ocean wonders surrounded by interesting gardens. From here one has a charming view along the coast. To the west lies Nice, nine

by the Turk, Montenegro long possessed a romantic interest aside from that given it by its picturesque mountains and its sturdy bright-costumed people. The country lies on the eastern shore of the Adriatic, just north of Albania, and the name means "Black Mountains." Until the Balkan War of 1913, which nearly doubled its area at Turkey's expense, Montenegro was only three-fourths the size of Connecticut.

In 1914 Montenegro came to the aid of Serbia when the latter was attacked by Austria, and as a result was overrun by the Austro-German armies. It was freed in 1918. After the war it joined Serbia in a new Slav state (*see* Yugoslavia). When this state was conquered and broken up by German and Italian armies in 1941, a national assembly, meeting at the old capital, Cetinje, declared Montenegro once more a constitutional monarchy.

The people, who number about two hundred thousand, are Slavic in race and belong mainly to the Greek Catholic church. They cultivate small farms and herd their flocks on their mountain pastures. They have a rich literature of patriotic songs and ballads, the outgrowth of centuries of Turkish warfare.

**MONTESSORI, MARIA** (born 1870). Most progressive schools of today emphasize liberty. Pupils are given the opportunities to follow their own bents, and are urged to concentrate on the activities

that especially appeal to them. The credit for this forward step in education belongs largely to Dr. Montessori, who was the first woman in Italy to be granted a medical degree and who has given her entire life to the study of education.

Liberty is the central principle of the Montessori school. Dr. Montessori believes that the child can develop his individuality and grow in self-reliance and in appreciation of the rights of others, only if he is allowed to work at those things which he himself



chooses. The teacher is not to be a dictator, but a supervisor and a guide. The interest of the pupil in his work is sustained by the pleasure which he has in doing it rather than by orders, rewards, or punishments. Concentration on attractive occupations develops self-control.

A second characteristic of this system is emphasis on sense training. Through appropriate exercises the child learns to distinguish between various sights, sounds, feels, smells, and tastes. A third point is the "exercises of practical life," through which the child learns to button, to lace, to sweep, to wash, to polish, and to perform other practical tasks.

To carry out these principles Dr. Montessori devised what she calls "didactic apparatus." This material is supposed to teach the child without the assistance of the teacher. For example, puzzles, each piece of which can be fitted into only one other piece, teach the child differences in shape and thickness. Dressing is taught by means of buttoning or lacing frames. Writing is taught by an ingenious use of sandpaper letters.

Dr. Montessori devised these principles when she was principal of a school for feeble-minded children. Her success with these children inspired her to try the same methods on normal children. In 1907 she founded a school at Rome which she called "Casa dei Bambini," or "House of Childhood." Within a few years this school was being imitated throughout the world.

Many educators hold that the Montessori method does not lay enough emphasis on the play element in education. Actual experience gives better preparation for practical life than does formal apparatus. The imaginative side of the child is largely ignored. Stories and musical interpretations are not widely used, though a few games are sometimes included in the program.

The Montessori method at first achieved a wide popularity, and in some European schools it is still a vital force. In the United States, however, it has largely disappeared as an independent method, but its best features have been incorporated into current educational systems.

**MONTEVIDEO, URUGUAY.** From nearly every point in the handsome and splendidly situated capital of Uruguay one has a view of either the vast turbid stream of the Rio de la Plata—here 60 miles wide—or of the land-locked Bay of Montevideo. For the city is built partly on a whaleback-shaped promontory that thrusts west from the coast, and partly on low hills along the shores. The streets rise one above the other like a series of terraces, affording a perfect natural drainage and making the city one of the most healthful in the world. A deep channel has been dredged and long breakwaters built so that the largest of ocean steamers can enter the harbor and lie alongside the wharves. Previously they had to anchor far out in the river and load and unload by means of small boats or lighters.

From any direction the view of this "City of Roses" is a lovely one. Flowers are everywhere, in private gardens and public parks; and along the curve of the bay are beautiful suburban residences. Many of the houses are of three stories, built of a stone quarried near by, and are in architecture much like the buildings of Europe. There are many imposing public buildings—banks, theaters, government buildings, normal schools, a military college, and a university. The streets are wide and laid out at right angles, as in the cities of the United States.

The principal industries are connected with cattle raising. There are several meat-drying and salting establishments in the city, in some of which one may see acres of posts strung with wire from which is hung meat being dried in the sun—the "jerked beef" which is the only cheap form of beef that can be kept any length of time in warm countries. Near the city is an establishment for preparing frozen meat, where thousands of cattle and sheep from the enormous Uruguayan ranches are killed every day. Other important establishments are dairies, creameries, and tanneries—outgrowths of the cattle industry. The manufacture of textiles, cement, shoes, and other commodities which are locally consumed is expanding. The city's population of about 695,000 is almost a third of the population of the entire country.

**MONTFORT, SIMON DE (1200?–1265).** "I fear thunder and lightning exceedingly," King Henry III of England once said to Simon de Montfort, "but I fear thee more than all the thunder and lightning in the world." And well might the inefficient king fear his powerful brother-in-law, who was leading the barons of England in their concerted opposition to Henry's misgovernment.

Simon de Montfort, a stern and warlike knight, was a Frenchman by birth who had become Earl of Leicester in England. At first the English barons distrusted him because of his foreign birth. On the other hand, although he had married the King's sister, he was frequently out of favor with Henry. When the King sent him to govern Gascony, or Aquitaine, one of England's possessions in France, he blamed Simon for violent and severe rule because of the complaints of rebellious lords.

It was after the earl had given up this task and returned to England that he became the leader of those who wished to end the king's misgovernment. When the barons saw that Henry did not intend to keep his promises to reform, they resorted to arms. "Though all men quit me," declared Simon de Montfort, "I, with my four sons, will remain and fight for the good cause which I have sworn to defend, and for the honor of the Holy Church and the welfare of the kingdom." In the first battle, fought at Lewes in the southern part of England, the barons were not only victorious but they also took captive King Henry and his son Edward.

While Simon de Montfort exercised power he made a change in the Great Council or Parliament for

which he will always be remembered. In calling a meeting in 1265 he summoned not only the barons and clergy but the knights of the shire, who had attended only occasionally in the past, and two townsmen from each of those cities and boroughs (towns) which could be depended upon to support his reforms. This is usually called the first Parliament, because it was the first in which the "Commons" (as opposed to the clergy and nobility) were represented.

Soon after this meeting Prince Edward escaped from captivity and rallied about him many of the nobles who were dissatisfied with Earl Simon's harshness. He showed much skill in forcing Simon to fight in an unfavorable position at Evesham in the west of England on Aug. 4, 1265. When the earl saw Edward's army approaching in great numbers and excellent order he said: "They come on skilfully, yet it is from me that they have learned this order of battle. God have mercy on our souls, for our bodies are Prince Edward's."

True to his prediction Simon and his barons were defeated though they fought bravely. The earl himself was slain, but the reforms which he had begun were continued by the wise Prince Edward. The people of England lamented the fall of "St. Simon," as they came to call the earl, and a song is preserved which they made soon after his death:

On Evesham's plain is Montfort slain,  
Well skilled our war to guide;  
Where streams his gore, shall all deplore  
Fair England's flower and pride.

**MONTH.** The word "month" comes from *mona*, the Anglo-Saxon word for moon, and its length was from one new moon to the next. This is called a lunar month (from the Latin *luna*, moon). It is usually reckoned as 28 days, but the actual mean duration is 29 days, 12 hours, 44 minutes, and 2.7 seconds. The lunar month is sometimes called a "synodic" month.

A "solar" month is one-twelfth of the time taken by the earth for its revolution around the sun. "Calendar" months differ in length, as is indicated in the old rhyme, of which one version runs—

Thirty days hath September,  
April, June, and November;  
All the rest have thirty-one,  
Save February alone,  
Which has twenty-eight days clear  
And twenty-nine in each leap year.

In computing interest 30 days is usually taken as a month.

**MONTREAL** (*mōn-trē-āl'*), QUEBEC. On May 17, 1642, a little band of French colonists landed on the island where the St. Lawrence and Ottawa rivers meet. Mass was celebrated by the light of fireflies imprisoned in a bottle. Thus was planted, in the words of a priest who accompanied the expedition, "a grain of mustard seed that shall rise and grow till its branches overshadow the earth." For this was the beginning of the city of Montreal, the commercial and financial heart of Canada, where nearly one-third of the Dominion's total trade is centered.

Although nearly 1,000 miles from the Atlantic Ocean, the city is reached by ocean-going steamers, and a system of canals and railroads connects it with the Great Lakes and the interior of the Dominion. On account of its location at the break in transportation caused by the Lachine Rapids, Montreal has become the largest and most important city of Canada and one of the greatest seaports of America. In addition to its enormous import and export trade it has a great number of diversified industries, including meat packing, and the manufacture of boots and shoes, railroad cars and locomotives, paper, clothing, flour, cement, lumber products, structural steel, and industrial machinery.

Montreal is a city of contrasts, and one of the most beautiful places on the continent. It is built on the southeast side of the island of Montreal, which is 30 miles long and from 7 to 10 miles wide. Behind it Mount Royal (from which the city takes its name) slopes up to a majestic height and the view from the top is one of the finest in America. About three-fourths of its inhabitants are of French descent, but three-quarters of the trade and business is in the hands of the British. The French, however, dominate the political life of the city. Most of the people speak both English and French, and both languages are officially recognized. Formerly it was the practice to elect British and French mayors alternately, but this custom has fallen into disuse.

A multitude of churches, many of them of great beauty and artistic merit, are scattered over the city. Here is the church of Notre Dame, built after the style of the famous Notre Dame in Paris; the new church of St. James, modeled after St. Peter's at Rome, and the Christ Church Cathedral, famed as one of the most perfect churches in Canada. Beside Notre Dame stands the seminary of St. Sulpice, a relic of the days of French rule and the earliest school in Montreal. Chief among the many educational institutions are McGill University and L'Université de Montreal. As elsewhere in the province of Quebec there are two systems of public schools, one for Roman Catholics and the other for Protestants. Population, 518,577.

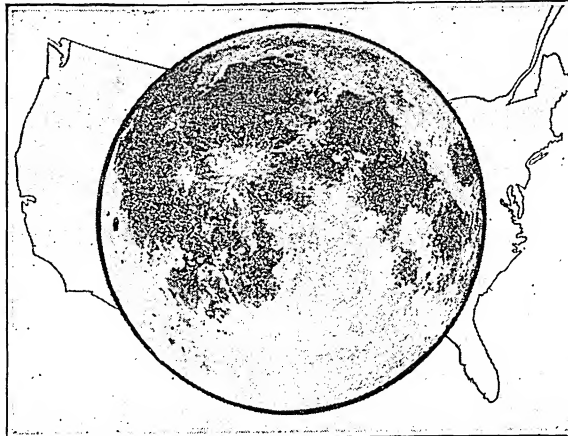
**MOODY, DWIGHT LYMAN** (1837-1899). At 17, the boy who was to become one of the most noted of American evangelists was a clerk in a Boston shoe store. Two years later he went to Chicago and became active in religious work, hunting up ragged children in the worst parts of the city and forming them into a Sunday-school class, which grew into a great mission. During the Civil War he also worked among the soldiers. Moody's great work was as an evangelist, but his many converts in Chicago founded a church, and made him their pastor. This charge did not keep him from carrying on many great revivals in other cities. With Ira D. Sankey, the singer (who died in 1908), he several times visited England. Much of his later life was given to building up the Moody Bible Institute in Chicago.

## The EARTH'S CHILD, RULER of the TIDES

**M**OON. The Moon is one of the smallest of the heavenly objects, but because it is relatively near to us it looks to be the largest, next to the Sun, and we know more about it than of any of the planets or stars. With a telescope we can actually see its mountains and ravines, its craters and broad expanses or plains, which early observers thought were seas. We know the geography of that part of the Moon which we can see nearly as well as we know the geography of the earth, and all the principal mountain ranges and craters and "seas" have been named. Among the ranges are those called the Caucasus, the Apennines, the Alps, and the Carpathians, some of whose peaks rise as high as 20,000 feet; among the craters are Apollonius, Archimedes, Julius Caesar, and Tycho, and among the "seas" are Mare Serenitatis (the "Serene Sea"), Mare Imbrium (the "Rainy Sea"), Oceanus Procellarum ("Hurricane Ocean"), Lacus Mortis ("Lake of Death"), and so on.

But such names are purely fanciful. There are no seas because there is no water, or very little, and there are no storms such as ours because there is practically no air or atmosphere. Indeed we might almost say that nothing ever happens on the Moon. There are no winds to stir the dust or waters to moisten it. No cloud ever moves in the airless sky or flash of fire comes from an erupting peak. The land is cold and dark, and over all broods a terrible emptiness.

With nothing to breathe and probably nothing to eat or drink, human life or any form of animal life could not exist on the Moon. Even if it could, life would not be very pleasant there from our standpoint. The lunar day—that is, the time from sunrise to sunrise—is about a month long. Two weeks of



This diagram shows how much of the Earth the Moon would cover if it were placed immediately over the United States.

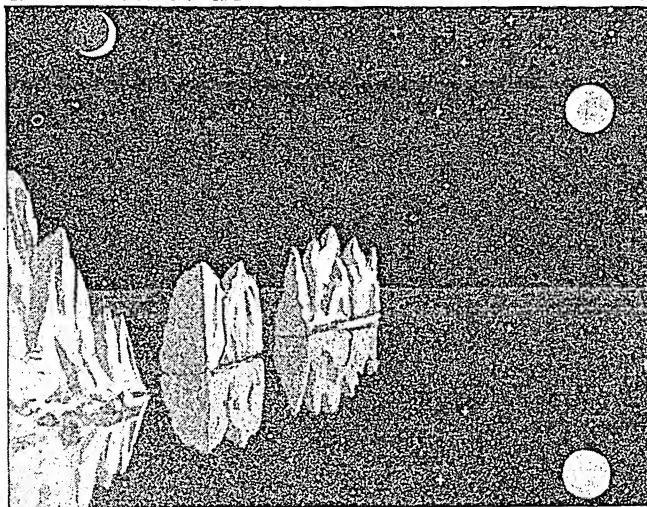
blinding, scorching sunlight are followed by two weeks of frigid arctic darkness. During the period of sunshine the temperature may go up to boiling, but during the long lunar night it probably goes down to 200 and even 400 degrees below zero.

In ages past the Moon was doubtless the scene of violent "moonquakes" and volcanic eruptions. Whether the volcanoes caused the craters, some of which are 100 miles in

diameter, is not known; they may possibly be the result of collisions with huge meteorites. In any event it is supposed that the Moon is now a dead planet.

The area of the Moon (14,685,000 square miles) is a little less than the combined areas of North and South America. Its diameter (2,160 miles) is about

### HOW LACK OF ATMOSPHERE AFFECTS SCENERY



This picture shows how a sea-side scene would appear, if the Earth lacked atmosphere, like the Moon. Without air there would be no diffusion of light, and the sky would appear as though it were night, save for the blazing reflection of the Sun on the surface of land and water.

one-fourth that of the earth, and it would require 49 moons to equal the Earth in volume and 81 to equal it in weight (or mass). The Moon's average distance from the earth is about 239,000 miles, whereas the Sun is 400 times as far away. It would take an airplane traveling 150 miles an hour somewhat more than two months to reach the Moon.

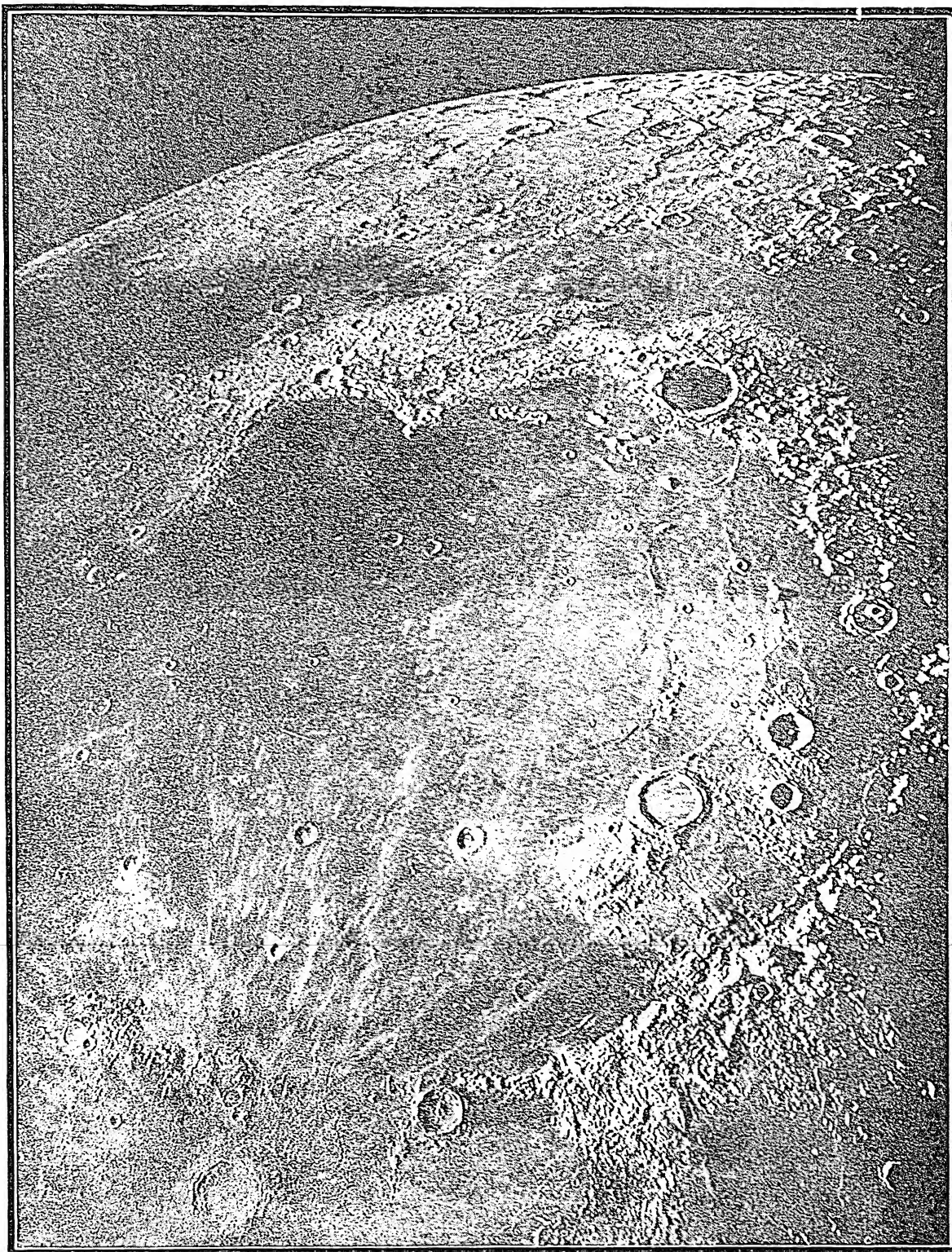
The moon is the Earth's only satellite. It revolves around the Earth because it is held in leash by the force of gravity exerted

by the superior mass of the Earth. But the Moon itself reacts on the Earth, causing tides (see Tide).

The phases of the Moon—"new," "half," and "full"—result naturally from its various positions with respect to the Sun and Earth. Deriving all of its light from the Sun, the Moon is "new" when it is between the Earth and the Sun; it is "full" when it is on the side of the Earth away from the Sun. Solar eclipses occur only when the Moon is new, and lunar eclipses when the Moon is full (see Eclipse).



## THE BARREN LANDSCAPE OF THE MOON



This striking photograph was taken with the 100-inch reflector at Mt. Wilson. The picture shows the moon in natural position, and not upside down, as it would be seen through a telescope. The smooth area in the center is the Mare Imbrium (Rainy Sea), bounded below at the right by the Apennines. The shallowest and most prominent of the three craters at the right near the mountains is Archimedes. Directly above Archimedes, on the margin of Mare Imbrium, is the black, ring-like plain known as the crater Plato. If you look closely in the lower left-hand corner you can make out the dimly outlined crater Copernicus, one of the hugest of all. It is 46 miles across and is rimmed in by mountains 12,000 feet high. The smaller crater to the right and above Copernicus is Bullialdus.

## The Vast and Shining Solitudes of the Moon

**T**HE mind of man can hardly conceive that life has ever been upon the Moon, but as we look at this silent world and see with our own eyes the mighty record of its past, we feel a sense of the boundless mystery of the universe. We stand on a world of life and look on a world of death. We see spread out before us, in the full light of the Sun, a landscape as vast as the American continent, with not a living thing upon it. Not a flower blooms, not a tree grows, not an insect creeps. Not a sound is heard, not a thing moving; the silence of a thousand ages is unbroken in this solitude that no man knows.

But it was not always thus. The energies let loose in the World War were like children's toys compared with the explosive forces that must once have rent and torn the Moon. Forces incalculable and unthinkable have made her what she is—beautiful to look upon as she rides in majesty with the Earth around the Sun, but with a face all scarred and worn with time, and the mark of some great agony written over it. Who is not moved by that picture of the Moon

which Prof. J. A. Thomson has given us? We may say of the Moon, in his words, that "it was Earth's only child, and it died!"

Several different theories have been advanced as to the origin and history of the Earth-Moon system. One of the most interesting of these was advanced by Prof. George H. Darwin, who sought to show that the Moon and the Earth were originally one mass and that they have come to their present state through the influence of the tidal action of each on the other. According to this theory the Earth, it is said, was once shaped like a pear, and as it spun around the small end of the pear broke off and spun around inde-

pendently. For ages and ages it went around the Sun side by side with the Earth; but slowly it got farther away, until at last it is where it is, as far away from us as ten times around the world. This happened, it is said, millions of years ago, when the Earth was cooling down from its molten state and a

crust about 30 miles thick had been formed; and the part which broke away equaled about 5,000 million cubic miles of matter. More recent investigations, however, have tended to show that, fascinating though this theory is, in all probability it does not accurately represent the past history of the Earth and the Moon.

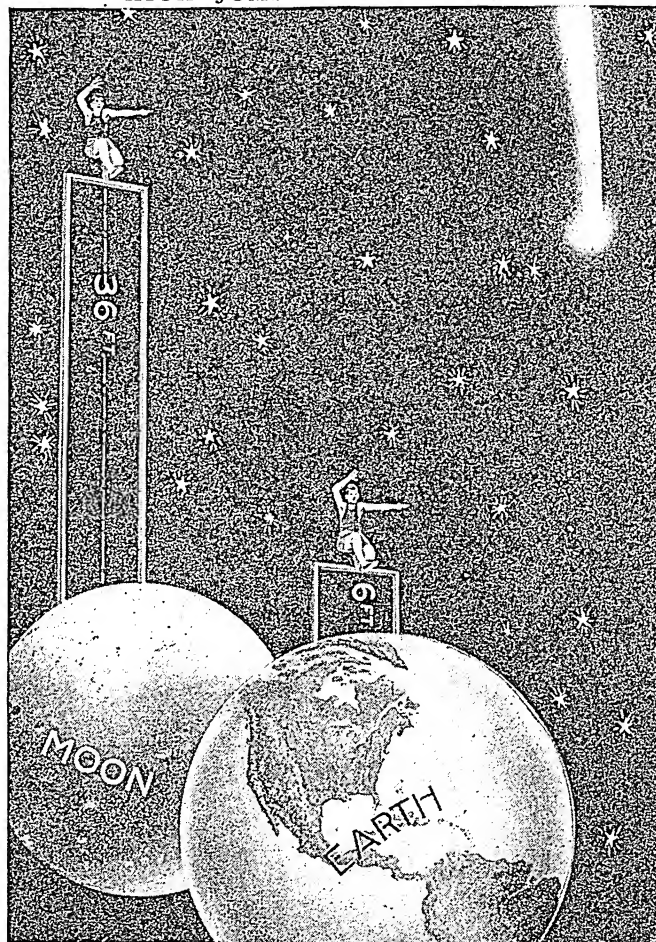
A more recent theory, and one with no outstanding facts against it, teaches that the Moon was formed by the drawing together of a great number of small masses about a larger one which attracted the smaller ones by reason of its greater mass. These small masses were probably of the same sort of material as those from which the Earth and other planets were built up. In all probability the Earth and the Moon were formed in the same way, at the same time, and

of material which came originally from the Sun as the result of some cosmic explosion (see Planets).

What has been the life of the Moon since then can never be fully known. So far as we know, no man has seen the whole Moon at any time, and whether life has ever been upon it no book can say. Certainly there was no life of any kind when the Moon was formed. Its mighty mass of red-hot matter was cooling down and there was not a living thing on either Earth or Moon.

The pull of the Earth on the Moon and the pull of the Moon on the Earth have never failed; and today they travel together and revolve together, so that the

"HIGH JUMPING" ON THE MOON



You could certainly set a world's record for high jumping on the Moon. Gravity only pulls one-sixth as hard there as it does on the Earth. Therefore, if you can jump six feet in an athletic contest here, your lunar leap would be 36 feet.

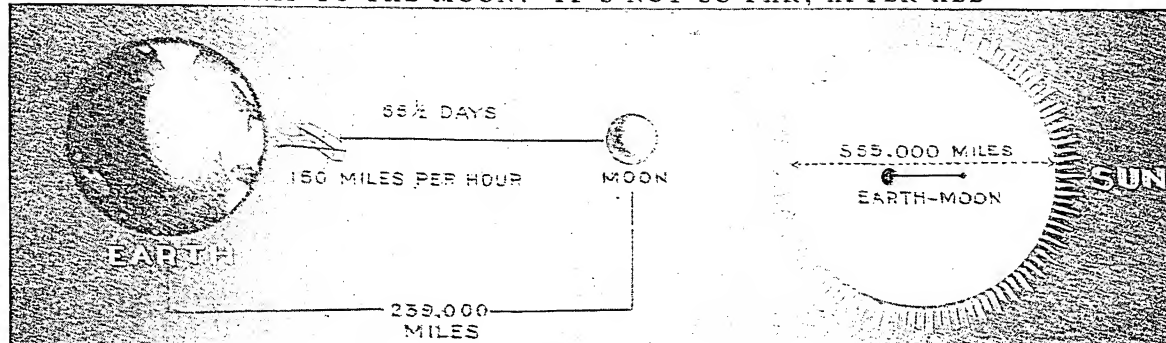


other side of the Moon has never yet been seen by anyone on Earth. But we know, from the face that we see, that the Moon has had an amazing history since it was first formed. The Sun pours down its light and heat on it unceasingly through a day 300 hours long. No life like ours could exist in the heat that reaches the side turned to the Sun; but on the opposite side the Moon is always as cold as ice, and no life like ours could endure a cold like that. A

passed away, all sound has gone. If we should shoot an explosive rocket against the Moon, its impact would be silent, for sound is carried by air, and over the Moon's surface, as between it and the Earth's atmosphere, there is an almost perfect vacuum.

Weird and strange indeed are the scenes on this dead world, and it is one of the triumphs of the human mind that we know them well. Long before we knew the North Pole of the Earth men knew the North Pole

#### A TRIP TO THE MOON?—IT'S NOT SO FAR, AFTER ALL



If you had an airplane that could travel two and one-half miles a minute, and if that airplane could, in some way, manage to fly across empty space, it would take you more than two months to reach the Moon. Perhaps this distance makes you gasp! But this is nothing compared to the next point in this picture. The diameter of the Sun is more than twice the distance between the Earth and the Moon. If the Earth were at the center of the Sun, the Moon could revolve around it, and still remain inside the Sun.

man living on the Moon would spend his long day in the tropics and his long night in the Arctic. He would have to endure alternately such heat and cold as human beings have never known.

#### A World without an Atmosphere

No atmosphere envelopes the Moon, so the fierce heat of the Sun pours down on it unchecked. There is no blanket to break its heat, no ocean of air to diminish its intensity or soften its dazzling light. And as there is no atmosphere, there is no "sky light," so that the Sun shines on the Moon from a dense black sky. It would look like a great white ball shining in pitch black night. When the Sun withdraws its light and the Moon is wrapped in night, the darkness there must be as in the darkness of a pit. A day and a night on the Moon are equal to a month on earth, so that for 14 of our days a man of the Moon will live in light and heat unknown to us, and for another 14 days in blackness and cold such as Earth never experiences.

We can hardly think of a world like that as anything but dead, and if the Moon was born when the Earth was born we may ask why it has died so soon.

Why is Earth still covered with green trees, and carpeted with flowers, and throbbing with the life of a myriad living things, while the Moon is dead and bare? It is because the Moon is smaller. If the Earth were small like the Moon, our air would gradually be left behind as the Earth traveled through space. With the air would go our water; and with air and water gone, no life would be possible on Earth. We would have the same great heat of the lunar day and the same extreme cold of the lunar night.

On the Moon, all life and water and air have

of the Moon. Men find their way about the Moon as easily as about the Grand Canyon of the Colorado or parts of Africa. It was the first thing man began to study in the heavens. If it filled men with dread in ancient time, it gave them their first ideas of anything beyond this world and their first glimmering of the outer universe. The shepherds of Chaldea would sit and look at it, and think it a sort of mirror in which the image of the Earth reflected back; and after Calvary, men saw the figure of Judas in the Moon, suffering transportation for his treason. Long after that, wise men, looking at the Moon through telescopes, imagined that the marks they saw were made by man, as some men think today of the marks on Mars. Old Kepler used to think that these huge crater-walls upon the Moon were built by man; they looked to him like the walls of pits built as shelters from the long fierce action of the Sun.

But Kepler did not know the nature of the things he saw—their vastness and their age. It is these craters that seize a man's imagination. They are the handwriting on the Moon. They are gigantic beyond anything seen on Earth, and the forces that made them are beyond our understanding. There are hundreds of them, and from some of them vast quantities of matter have been flung for more than 20 miles. Their walls rise up miles high and some of them are so wide that two men standing one on each side would be as far apart as if one were at the Atlantic end and the other at the Pacific end of the Panama Canal. The walls rise sheer like walls of houses, but they fall away outside, and for a hundred miles at times we can trace the vast extent of those tremendous forces which flung up burning lava in molten streams from the



furnace of the Moon. These craters, according to one theory, are the remnants of volcanoes, but to what can we compare the mighty cataclysms which tore the very heart of the Moon to pieces and left it yawning with chasms and stricken with death?

The Moon is only one-sixty-fourth the volume of the Earth and one-eighty-first of its mass, and gravity there has only one-sixth of its force on Earth. Explosive forces on the Moon, would be six times as effective as on Earth. Things on the Moon are only a sixth as heavy—a brick that weighs six pounds here would weigh one pound there; a man who can jump six feet here would jump 36 feet there; a gun that fires ten miles here would fire 60 miles there.

We can imagine, therefore, that these internal forces that seem almost to have torn the surface of the Moon to bits must have been beyond all human experience or conception. In parts the surface of the Moon is strewn thick with craters; and rising from the floor of these we find enormous cones, standing like obelisks, sometimes a mile high, and sometimes with another crater in the cone, formed, we may suppose, by the last expiring efforts of the eruption that built up the great circular walls. Some craters have cracks across that are quite a mile wide, and one great crater, more than 50 miles across, is filled to the brim with lava, as if it had oozed out after the walls had been formed until it filled the huge round pit with a mass of solid rock.

#### Those Frightful Blow Holes in the Moon

It is believed that sometimes, in these explosions on the Moon, a single eruption may have sent forth, crashing out of the red-hot depths, hundreds of cubic miles of matter. In some craters there are gaps across the surface a mile wide and 150 miles long, and deeper than from the top of our highest mountain to the bottom of our deepest sea.

And, as chasms are deeper and craters wider, so mountains are higher on the Moon. A grain of mustard seed on a globe three feet across would represent the highest mountain on the Earth, but a grain of seed on a globe one foot wide would stand for the highest mountain on the Moon.

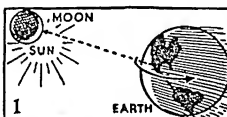
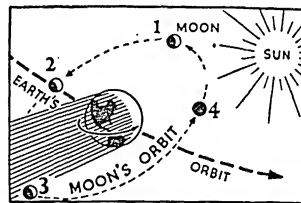
Cliffs on the Moon are much steeper than on

Earth, and the mountain scenery, if we could see it as we see the Rocky Mountains or the Alps, would be far grander than our own. One mountain chain has 3,000 mountains packed together; the lunar range we call the Alps has 700 glorious peaks, with an immense valley 80 miles long and 5 miles wide that seems to have been cut with a knife.

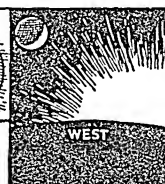
Amazing are those white pathways that seem to

#### PHASES OF THE MOON THROUGH THE MONTH

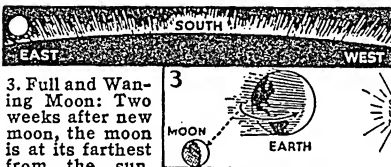
Because of the earth's rotation, the moon seems to move from east to west across the sky. But the moon, in its monthly revolution around the earth, moves from west to east, or *against* the direction of its apparent daily motion. The diagram at the right indicates these relative motions, and shows the phases, or appearances, they create. They are (1) the new moon, which popularly means the first visible phase after the astronomical new, or dark, moon; (2) the half moon; (3) the full moon; and (4) the old moon. Below we see the moon's position in relation to sun and earth in each of its phases, and also how it appears from the earth.



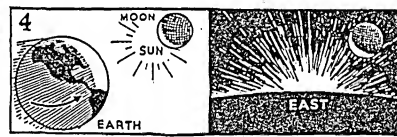
1. New Moon: When the moon is in line between earth and sun, its dark side is toward us and we cannot see it. A night or so later, the moon has moved enough to show the edge of its lighted side as a thin crescent, with tips or "horns" that point away from the sun. Since the moon is still near the sun line, it can be seen only in the *west* just after sunset, from the twilight zone, as the dotted arrow shows.



2. Half Moon (Waxing): About a week later, the moon has moved far enough along in its orbit to show half its lighted side to the earth. This quarter-turn around the earth makes it visible in the *south* instead of the *west*, at sunset. Rotation of the earth causes it to move westward across the sky, and to set at about midnight.



3. Full and Waning Moon: Two weeks after new moon, the moon is at its farthest from the sun, and is full, with its lighted side toward the earth. It also is halfway around in its orbit, and *rises in the east* after sunset. Thereafter, as it wanes and loses its round appearance, its lighted portion is toward the east, and its horns point westward. It continues to rise roughly an hour later each night.



4. Old Moon: Toward the end of the lunar month, the moon has swung near enough to the right-hand side (as we see it) of the sun, to appear in the eastern sky just before sunrise. The bulge of the old-moon crescent is toward the sun and the horns point to the right. This completes the cycle.

creep wherever we look in the Moon. From one great crater we can trace them for 1,000 miles. One is said to be 1,700 miles long, and they are sometimes 25 miles wide. They go over mountains and plains, over craters and through valleys, straight on and on everywhere, marching like the little Earth creatures called lemmings in those vast migrations which lead them in a straight line to the sea. Somebody has said that if a brush had been drawn across the face of the Moon in a thousand directions the effect would be to give us these white streaks, and they are among the mysteries of the lunar world. They are probably outflowings of lava through the great cracks around volcanoes, but the minds of astronomers are as much puzzled by them as by those enormous areas on the Moon which look like seas. They are not seas, for there is no water on the Moon. But perhaps these great smooth surfaces—though what seems to us as

smooth water is broken in ridges and cracks extending for miles—may be due to the falling of the thin crust into the molten bed below, so that what we see may be the surface of a molten lake turned solid.

Such a world of stillness and mystery and death is this vast and shining solitude of the Moon. We have called it "Earth's dead child"; but we know that nothing can die and cease to be, and Earth's dead child has its glorious immortality.

If the Moon is dead it keeps life sweet on Earth. Perhaps you have not thought of it, but as the Sun keeps our atmosphere in constant circulation through the winds, so the Moon does with the waters. It saves the oceans from stagnation. It is the greatest sanitary agent that any man knows, Nature's beneficent agent for us all. The power of gravitation runs from Moon to Earth and Earth to Moon, and the pull of the Moon on the sea brings the tides up on the shore twice a day. They cleanse the seashore as nothing else could, and carry off the deposits of rivers which otherwise would bring us plague and pestilence.

Aside from causing the tides, the moon undoubtedly tends to slow down the Earth in its rotation. Just how fast the tidal friction will work to lengthen the day is hard to say but it is certain that it will not be more than one second of time in half a million years, so we may lift up our hearts; it will not hurt us. There are good times coming long before the Moon has slowed us down to any considerable extent, and who shall say that the Moon may not have a service still to render to the Earth beyond all our imagination? She may help us with our labor; she may release men from the present burdens of toil.

#### How the Moon Helps Start Big Cities

Not so very long ago the traffic in our harbors lay at the mercy of the Moon. Our ships sailed up our rivers with the tides, and in the race between wind and tide, the tide would always win. Who will write a book to prove that the Moon put our great cities where they are? It is probably true, for had there been no Moon there would have been no tides and had there been no tides, who would have built New York and Philadelphia where they are?

But let us keep to our story, and think of that boy who, though he knew it not, set out to fight the Moon and win the fight. He was little James Watt, whose aunt would bully him gently for sitting wasting his time watching the steam puff out of the kettle-lid. "You lazy boy, James Watt!" she would say. "Have you nothing better to do than to sit for hours looking at that kettle?" But James Watt was fighting the Moon, and he was winning. He brought steam power into the modern world, and Richard Trevithick and George Stephenson and Robert Fulton, and all the rest of those great pioneers of steam, were fighters of the Moon, although they knew it not.

For steam power makes our ships independent of the tide and more powerful than the wind, and no longer need our sailors await the Moon's convenience.

Well, we have won our independence of the Moon,

and now we have to harness her. Millions of tons of water are lifted twice a day for many feet, and we let this mighty power run to waste. It would do the work of half the nation if we made it turn a wheel.

A hundred years ago at London Bridge the rising waters as the tide came in, the rushing river as the tide went out, were made to work pumps that carried water to London people. This power of the tides was one of the good things of the past that men stopped instead of building up. The time may come when we shall build it up again, and then all men who toil will bless the Moon, for it will be the slave of Earth chained to our factories, turning wheels, driving our machines. It may all come "with time and tide," as the poet says.

**MOORS.** When the Arab armies swept across northern Africa in the 7th century, they found in the northwestern corner of the continent a white race of ancient origin called the Berbers. These they converted to Mohammedanism after a sharp struggle at the beginning of the 8th century. Then Berbers and Arabs joined in invading and conquering Spain, and a mixed race sprang up called the Moors.

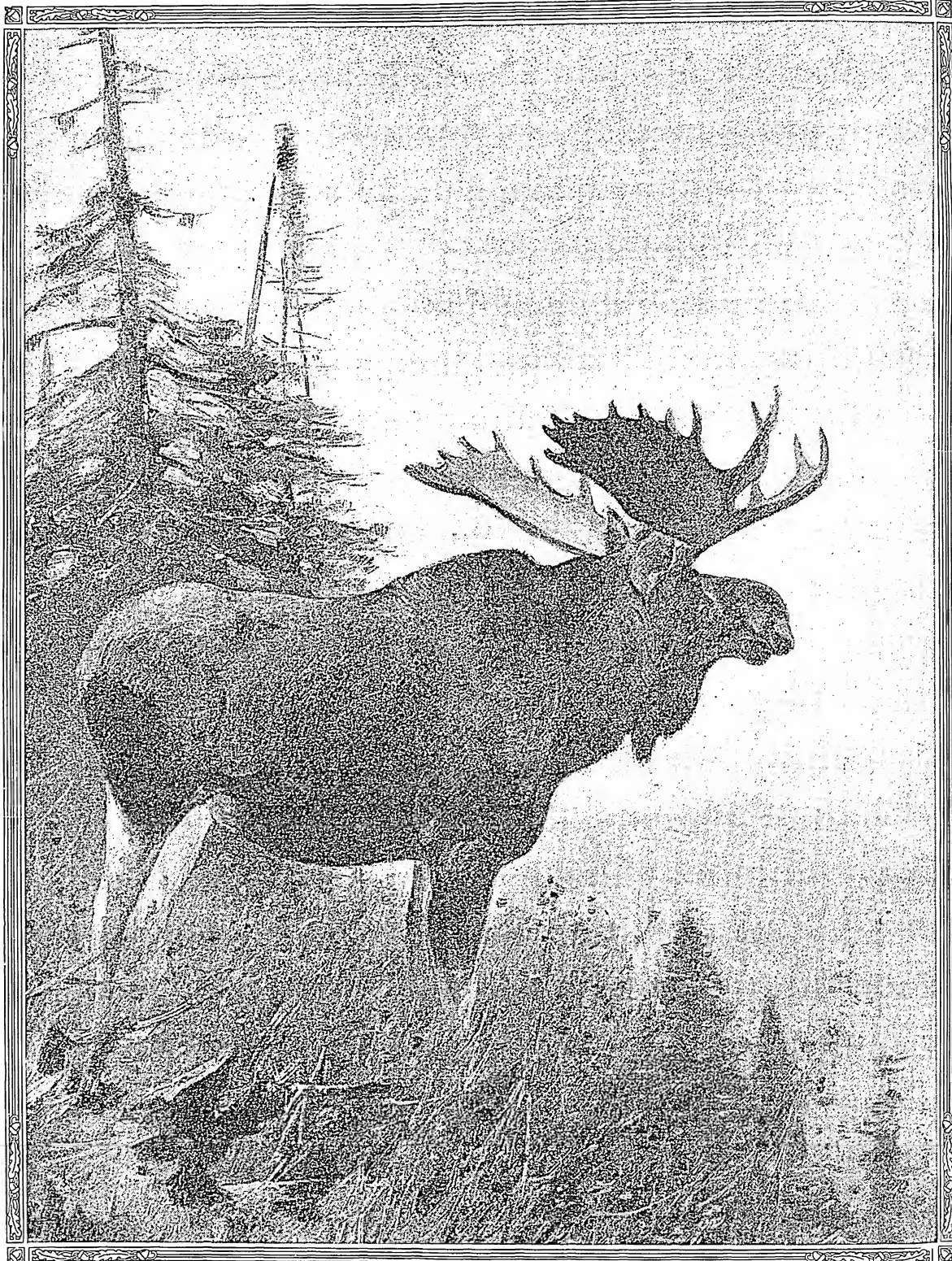
The name Moor comes from the Latin *Mauri*, the name for the Berber inhabitants of the old Roman province of Mauretania, now Morocco. It is applied today chiefly to the people of mixed blood inhabiting the seacoast of the Barbary States. The typical Moors of Morocco are a handsome race, with olive skin, black eyes, and black silky hair. The women are beautiful in early youth, but grow fat rapidly, a quality much admired by their own people. The Moors are courteous and intellectual, but also cruel and revengeful. Of all the pirates who infested the Barbary coast in former days, none was more feared than these mild-mannered cut-throats.

The Moors reached the height of their power in Spain. After the conquest of the Visigoth kingdom in 711, and a period of great disorder, the famous Arab Caliphate of Cordova was formed which lasted until 1031. Following the collapse of the caliphate, the Moors (Berber-Arabs) who had obtained control of northwestern Africa crossed to Spain and wrested the power from the pure-blood Arabs.

After the battle of Navas de Tolosa in 1212, in which Alphonso VIII of Castile broke the Moorish power in central Spain, the Moors still ruled the kingdom of Granada, which rose to a splendor rivaling the former Caliphate of Cordova. It was not until 1492 that the power of this Moorish kingdom, weakened by internal discord, was shattered by the armies of Ferdinand and Isabella.

The Moors were then expelled from Spain, to the great economic and intellectual loss of that kingdom. A number adopted Christianity and remained in Spain. About 60,000 of their descendants, called Moriscos, dwell in Spain today. Many remains of the days of Moorish greatness are still found in Spain, chief of which is the Alhambra palace at Granada. (See also Arabia; Mohammed; Morocco; Spain.)

## THE MONARCH OF THE NORTHERN WOODS



Here he stands, an Alaskan Bull Moose, the most powerful wild animal of North America. When he's in a hurry, he simply pushes his way through the underbrush, overthrowing any small trees which stand in his way. He fears no forest foes, for he is a match for anything except the huntsman's rifle, and is a fierce and courageous fighter. Specimens such as the one shown attain weights as great as 1,400 pounds, and boast antlers measuring six feet from tip to tip. Moose are found chiefly in Maine, Minnesota, northern Michigan, and Canada.



**MOOSE.** The largest living deer common to the northern regions of the Old and the New World is the elk or moose—for the latter is merely the American counterpart of the European elk. In the Old World the elk is now scarcely found except in the northern parts of Russia and Scandinavia. In the New World the moose is found mostly in northern Maine, Minnesota, and British North America. It has long legs, standing about six feet high, and a large head with broad muzzle and large nostrils. The average weight is about 700 pounds, while unusually large specimens attain a weight of from 1,100 to 1,400 pounds.

The moose can easily be distinguished from all other deer by the magnificent horns or antlers of the male, which sometimes attain a spread of more than six feet. Each antler is like a broad hand, with the palm curved and held upward, and with the margins set with prongs. An average full-grown pair of antlers, with the skull, weighs 70 pounds. They grow gradually, the first year being only knobs an inch high, the second year they grow to about a foot in length, and the third year they take on their palm-shaped character. The fully formed horns are shed in December, sprout again in April, reaching their full size in June. It is remarkable to think of these enormous horns being shed annually and produced again in so short a time.

The moose feeds on willow-tips, on the slender shoots of the striped maple, and other trees, and on bark and various evergreens. It often wades in water up to its neck, to escape flies and mosquitoes and to feed on succulent water-plants. When enraged a bull moose strikes vicious blows with its front feet as well as with the heavy antlers, and is a dangerous foe for man or beast. Moose are rapid runners, and have sharp senses of hearing and smell; as a result they are difficult to hunt. In winter they herd in small troops for protection.

In America the wapiti is often wrongly called "the American elk." In Europe remains are found of an extinct deer, with branching antlers 10 feet across, which is usually called the giant "Irish elk."

**MORE, SIR THOMAS (1478-1535).** "I say no harm, I think no harm; but I wish everybody good," once declared Sir Thomas More, the great English statesman, scholar, and author. This was no idle boast, for the man who made it was a lovable merry man, with warm affections and a kind heart. Among his children he was a loving companion, and often he would take scholars and statesmen into his garden to see his girls' rabbits. And yet this kindly genial man wished it engraved on his monument that as lord chancellor he was "the scourge of thieves, murderers, and heretics." Surely it would be hard to find a character which blends into harmony so many apparent contradictions as Sir Thomas More's.

Son of a prominent London barrister, young Thomas More was reared as a page in the household of Cardinal Morton, who prophesied greatness for his ward. As a student at Oxford, More came under the influence of the New Learning, and later formed a

close friendship with the great Dutch scholar, Erasmus, who was captivated by his charming personality. These two, with John Colet, the distinguished dean of St. Paul's, were the leaders of a group of scholars and religious reformers in England since known as the "Oxford Reformers," who did much to promote the Renaissance in England (*see Renaissance*).

Entering his father's profession of law, More early attained distinction; but for a time religious piety led him to fast, pray, and scourge himself as a preliminary to entering the priesthood. He finally gave up this plan, but the religious motive remained supreme in his life, and every Friday he scourged his body as penance for sin.

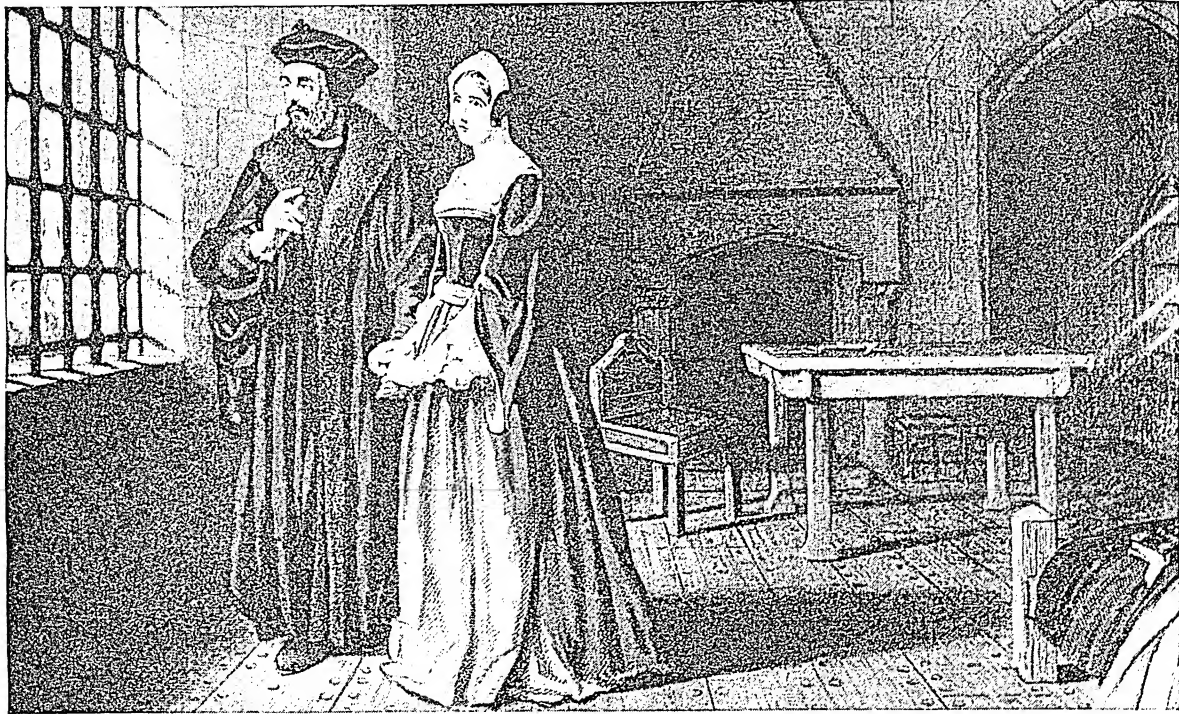
#### His Dispute with the Throne

In 1504 More gained the enmity of Henry VII by opposing, as a member of Parliament, the King's exorbitant demands for money aids. The accession of Henry VIII brought More, almost against his will, into high place at court. The young king was attracted by the rising lawyer's learning, wit, and geniality, and employed him on various embassies. He knighted him, promoted him through various official posts, and on Cardinal Wolsey's fall from power, in 1529, More was made chancellor—the first time that the office had been held by a layman. More, like Erasmus, wished for an orderly reform of acknowledged abuses in the church, but he did not hesitate to burn as heretics persons who were infected with Protestant heresies from Germany. When it appeared that Henry had resolved on a divorce from his queen, Catherine of Aragon, More as a loyal churchman resigned his office on the plea of ill health. He refused to acknowledge Henry's claim to be head of the English church, and for this defiance the King had More—together with Bishop Fisher and others—committed to the Tower on a charge of treason. Against the pleadings of his favorite daughter, Margaret Roper, his wife, and his friends, More stood firm, and on July 6, 1535, he was beheaded on Tower Hill. This was made his festival day when he was canonized by Pope Pius XI 400 years later.

Even in his death More's wit did not desert him. Climbing the scaffold where he was to die, he said to the officer in charge: "I pray you see me safe up; as for my coming down, let me shift for myself." When the ax was about to fall he asked the executioner to wait a minute until he had removed his beard, observing, "Pity that should be cut, which has never committed treason."

More's fame is not merely as a statesman and religious martyr, but as the author of 'Utopia', a romance written in Latin in 1516, and translated into English in 1551. 'Utopia' (which means "nowhere") is the name of an imaginary island which More represents as the abode of a happy society, free from all cares, anxieties, and miseries. All men are equal, and everyone may worship as he chooses. None is allowed to become rich through the oppression of others; property is held in common, and all are

## SIR THOMAS MORE IN THE TOWER OF LONDON



Here are Sir Thomas and his daughter, gazing out the window upon four monks being led to execution, during the stormy times when Henry VIII broke with the church of Rome. Sir Thomas, formerly chancellor of the kingdom, had been imprisoned charged with treason when he opposed Henry's move. His family urged him to acknowledge Henry's supremacy, but he stood fast, and eventually died upon the scaffold. On the occasion which this picture illustrates, he characterized the monks as "blessed fathers who were going as cheerfully to their deaths as bridegrooms to their marriage," and it was in this spirit that he met his own fate.

required to perform the same amount of labor. The book had a political object, for the evils which it depicts as remedied in Utopia are those which then bitterly afflicted England. From the title of this book we get the adjective "utopian," which is applied to plans for the improvement of society that are considered visionary and impracticable.

**MORMONS, OR LATTER-DAY SAINTS.** The term "Mormons" is really a nickname for members of The Church of Jesus Christ of Latter-Day Saints, and also of the Reorganized Church of the same name.

Joseph Smith (1805-1844), founder of Mormonism, received his first heavenly manifestation, it is said, at the age of 14. Other visions followed, including those which revealed to him the Book of Mormon, which purports to be a record of the early inhabitants of America—three groups of people, one of whom had come from Babylon at the time of the confusion of tongues, and the other two from Jerusalem about 600 B.C. He organized the Church of Jesus Christ of Latter-Day Saints with six members at Fayette, N. Y., April 6, 1830. Missionaries were sent out and branches were started in various states and in Europe. Headquarters were established at Kirtland, Ohio, Independence, Mo., and at Nauvoo, Ill. Following trouble with non-Mormons, the Mormon leaders were thrown into jail at Carthage, Ill. On June 27, 1844, a mob stormed the jail and killed Joseph Smith and his brother, Hyrum.

The Mormons then decided to go to the Far West. On their thousand-mile trek to the valley of the Great Salt Lake, one of the notable migrations in history, they were led by Brigham Young (1801-1877). They arrived in July 1847. This first band of Mormon pioneers consisted of 143 men, 3 women, and 2 children.

The Mormon church has a well-defined doctrine and plan of church government. It believes in a personal God who can and does reveal himself in these days as in Biblical times. It claims to enjoy the power of his priesthood by virtue of which its officers preside and function. It has an organization through which the greatest possible number of its members can be given actual responsibility. The local unit is the ward, presided over by a bishop and his two counselors. The thousand wards are grouped into a hundred "stakes," each of which is presided over by a stake president and two counselors. The general authorities who preside over the church as a whole consist of the president with two counselors, the quorum of the 12 apostles, the 7 presidents of 70, the presiding patriarch and the presiding bishopric.

It operates a missionary system under which 2,000 young men and women at their own expense regularly carry its message to the world. There are missions throughout the United States, New Zealand, Europe, South Africa, Australia, Canada, Mexico, South America, Hawaii, and other islands of the Pacific.

Through its various organizations, the Mormon church enters into almost every phase of the life of its people. It maintains schools and seminaries. Its Primary Association provides training for children between the ages of four and twelve. Through its Mutual Improvement Associations young people study religious, scientific, and literary topics. The Relief Society and the Welfare Program take care of people in sickness and want. Through investments in numerous industrial and commercial enterprises the church has also become closely linked with the economic life of its members.

The church is financed through a system of tithing. New members contribute one-tenth of their property to the church, and all members contribute one-tenth of their annual income.

Because polygamy was once practised among a small percentage of its members, the church was severely criticized. In 1890 Wilford Woodruff, then president, ordered members to "refrain from contracting any marriages forbidden by the laws of the land." Since then the policy of the church has been definitely against plural marriages.

The Church of Jesus Christ of Latter-Day Saints has about 750,000 members in the United States and thousands abroad. Its headquarters, with the famous temple and tabernacle, are in Salt Lake City. (See Salt Lake City; Utah.)

#### The Reorganized Church

The Reorganized Church of Jesus Christ of Latter Day Saints was set up in Wisconsin in 1852 by a group that repudiated Brigham Young's leadership. Joseph Smith, son of the founder of Mormonism, was president from 1860 to 1914. His son Frederick M. Smith succeeded him. The organization and government of the Reorganized Church are similar to that of the Utah Mormons. It also has its own schools, hospitals, and missions. Members hold that the doctrine of plural marriages was not taught by Joseph Smith, the founder, or sanctioned by the original church. There are about 110,000 members in the United States, and branches in other countries. Its headquarters are in Independence, Mo.

**MORNING-GLORY.** With the first light of dawn in summer, the sleeping morning-glories open their dainty bell-shaped blossoms. They can be seen almost everywhere. The wild morning-glories twist and wind among wayside shrubbery; and in our gardens the cultivated ones climb up walls, trellises, and arbors.

The common morning-glory is one of the cultivated species. It has purple, blue, or pink flowers about three inches long, sometimes double. Its five-inch leaves, broad and heart-shaped, grow from a trailing stem four to ten feet long. It has many close botanical relatives—among them the sweet potato—and the different species are widely distributed throughout the tropical and temperate regions of the world.

Morning-glories are remarkable for their trailing or twining habit of growth. Some are annuals and some are perennials. They will flourish in any good soil but

prefer a sunny spot, and can be raised either from seed or from cuttings. Because of their rapid, vigorous growth and their profusion of leaves and blossoms, they are a favorite with gardeners for covering fences, verandas, and for screening unsightly objects.

Scientific name of common morning-glory, *Ipomoea purpurea*, annual; sweet potato, *Ipomoea batatas*, perennial; wild morning-glory, *Convolvulus sepium*, perennial.

**MOROC'CO.** On the northwest corner of Africa lies Morocco, a rugged country slightly larger than California. Here African soil comes closest to Europe. In ancient times the northern tip of Morocco was one of the two Pillars of Hercules. The other was Gibraltar, in Spain, nine miles across the water. The ancients considered the Pillars the western limits of the civilized world. Today the Strait of Gibraltar is considered a gateway to the Mediterranean, and many nations have been eager to possess or control the Moroccan side of the gate. This eagerness was increased by the potential wealth of the country.

A culminating episode in the troubled history of Morocco was seizure of the land by American forces in November 1942, as part of a plan to launch a large-scale offensive against the Axis powers. This seizure was preceded by a long record of intrigue and violence which diplomats called "the Moroccan question." Before 1914 intrigue was invited and made easy by the laxity of the Moroccan government. The only law, aside from the Mohammedan Koran, was the whim of the sultan. The government did not pay salaries, and every official from the highest ministers or *wazirs* down to village sheiks enriched himself as best he could by graft, extortion, and taking bribes. Bandits infested the land. In 1905 the notorious bandit Raisuli captured Ion Perdicaris, a naturalized American citizen, and held him for \$70,000 ransom. Secretary of State John Hay demanded "Perdicaris alive or Raisuli dead," and this ultimatum forced the sultan to pay the ransom.

#### European Dealings with Morocco

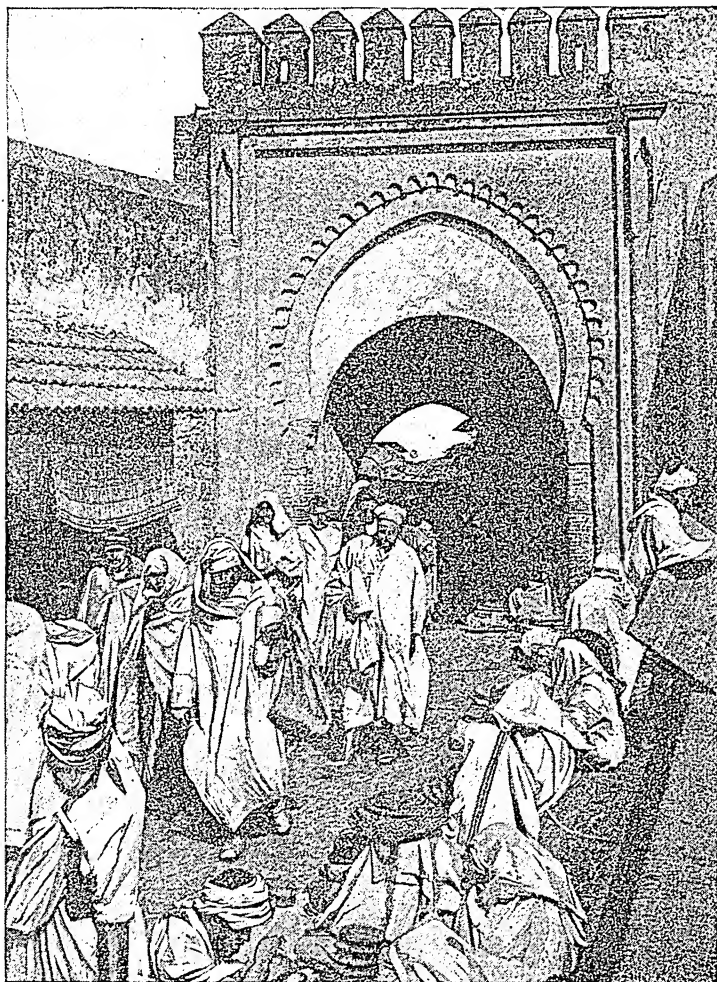
The European nations most vitally interested in Morocco were Spain, France, Germany, and Great Britain. Spain was interested as an immediate neighbor. France was interested because lawless conditions in Morocco imperiled French interests in the adjoining territory of Algeria. Before 1914 Germany was eager to seize colonial advantages wherever possible, and Morocco was an obvious prize. Great Britain was interested, because of a possible threat to its naval base at Gibraltar.

These rivalries boiled over in 1905, when Germany demanded a settlement of Moroccan problems. An accompanying threat of war was met by a conference at Algieras in Spain in 1906. The conference largely upheld the position of France. Then in 1911 Germany again brought Europe to the verge of war by sending its gunboat *Panther* to Agadir (on the Atlantic coast), in violation of what France considered to be its right in the country. France and Germany mobilized their armies, and only when Great Britain let it be understood that it supported France did Germany agree



to a peaceable settlement. By this she recognized a French protectorate over Morocco, in return for the cession to Germany of a large area of French territory in central Africa. The aggressive party in Germany remained dissatisfied, however, and the war cloud of 1911 helped produce the whirlwind of 1914.

## SHOPPING IN TANGIER



The pedestrians have just entered the city through the Gate of the Market (Bab el Sok) and are inspecting the wares of the street vendors. Keen bargaining always precedes the sales, and purchasers must be discerning judges of quality in order not to be cheated. The principal thoroughfare of Tangier begins at this gate and runs through the city to the Gate of the Port (Bab el Marsa).

The French protectorate, accepted by the sultan in 1912 and still in force, recognizes Spain's interest in a strip running 200 miles eastward from the Strait of Gibraltar. In 1921 Spain was all but ousted by the Rifians under Abd el Krim; but the Rifians attacked French outposts in 1925, and French power, added to Spanish, compelled Abd el Krim to surrender in 1926. In 1940 Spain added to its territory the former international zone of Tangier (see Tangier).

Morocco is cut in two by the Great Atlas Mountains, running east and west (for map, see Algeria), and containing Jebel Ayashi (14,600 feet), Northern Africa's loftiest peak. This range screens off the

desert heat, but south of it summer heat and winter cold are extreme.

Morocco produces great quantities of grapes and nearly all kinds of European and tropical fruits. Grain growing is on the increase, wheat, barley, oats, and beans having been added to *durra*, the native millet.

Sheep, goats, cattle, and horses are raised. The mineral resources include phosphates, coal, manganese, lead, molybdenum, iron, tin, antimony, and zinc.

The chief cities in the French zone are Casablanca, Marrakech (Marrakesh), Fez, and Rabat. In the Spanish zone the principal cities are Tetuan and Alcazar.

The people are chiefly Berbers, Arabs, and Jews. The Berber mountaineers are the hardiest, most numerous, and most industrious. The mixed Berber-Arab people of the coast towns, known as Moors, are mostly descendants of Moslems who were driven out of Spain in 1492. The large Jewish population likewise traces its origin to the Spanish exiles of an earlier period. In the French zone are more than 200,000 French colonists. Area, about 165,000 square miles; population, about 7,130,000.

In ancient times Morocco was known as Mauretania, and its early Berber natives were subjects first of Carthage and then of Rome. In 429 the country was overrun by the Vandals, who introduced the system of piracy which gave the Barbary coast an evil name for 15 centuries after. In 682 the Arab armies, carrying the green banner of Mohammed, seized Morocco. From that time on a long and confused contest went on between the Berber chiefs and the Arab descendants of Mohammed for supremacy. At one time the rule of the sultan of Morocco was extended clear across the Sahara Desert to Timbuktu, but later the anarchy and disorder set in which persisted down to the French occupation.

In the Middle Ages Morocco was a center of learning and of industries. The city of Fez had a university as early as 859. Here skilled workers cure the soft, hand-grained goatskins famed as Moroccan leather and imitated throughout the world. They decorate bookbindings, purses, and other articles made from it, in exquisite Moorish designs.

**MORRIS, ROBERT** (1734-1806). The difficult task of Robert Morris, "the financier of the American Revolution," was perhaps the most important factor in the winning of American independence, next to the alliance with France and the actual fighting. Upon his success in raising money from the people, or borrowing it abroad without security, depended the possibility of carrying on the war.

Although Morris was an Englishman (of Liverpool) and a man of wealth by birth, he early espoused the cause of the colonists, and in 1765 joined in the opposition to the Stamp Act. In 1775 he was elected a member of the Second Continental Congress. As a

member of that body, the next year, he voted against the Declaration of Independence, because he considered that "it was an improper time, and would neither promote the interest or redound to the honor of America." But when the Declaration was adopted, Morris signed it, and thenceforth devoted his energy and the fortune he had acquired in the banking business to make the Declaration come true. At times he even borrowed on his own credit the money needed to carry on the campaigns in the field.

From 1776 to 1778, and from 1781 to 1784, Morris managed the finances of the country—first as a member of the finance committee of Congress, and later as superintendent of finance. As one means of raising money to carry on the war, in 1781 he established in Philadelphia the Bank of North America. This was the first financial institution chartered by the United States.

In 1787 Morris was a member of the constitutional convention which sat in Philadelphia and was an ardent supporter of the new Constitution, but he declined the position of Secretary of the Treasury which was offered to him by Washington under the new government. As a result of some unsuccessful land speculations, he was by that time heavily involved in debt. These financial difficulties increased owing to the dishonesty of one of his partners and the failure of a London bank, until in 1798 he was confined in a debtor's prison. He was kept there for more than three years, and was finally released by the passage of a national bankruptcy law, in 1800, which ended imprisonment for debt in this country. He died in Philadelphia five years later, without having recovered his former financial standing.

**MORRIS, WILLIAM** (1834–1896). "A man should put his heart into his work, and that work should be the kind that he can care about." This was the creed of the English poet and artist, William Morris, a practical dreamer of extraordinary energy and versatility who had a strong influence upon the literary, artistic, and social life of his time.

The young Morris was remembered by school-fellows at Marlborough as "a thick-set strong-looking boy, with a high color and black curly hair, good-natured and kind, but with a fearful temper"; a strange boy fond of doing things with his hands, of taking solitary strolls, and of telling long stories "full of knights and fairies."

During quiet Oxford days at Exeter College he began a life-long friendship with Edward Burne-Jones, who later became a great artist. Both Morris and his friend early developed a passion for a remote ideal beauty, particularly that of the Middle Ages. Then under the influence of Dante Gabriel Rossetti, the poet-painter, Morris and Burne-Jones joined his group of Pre-Raphaelites. The Pre-Raphaelites, so praised by Ruskin, were a small body of poets and artists who broke away from the conventional insincere attitude that marked most of the art of the day, and sought inspiration in the simple genuine

religious art preceding Raphael. Both in art and literature they strove for a quaint simplicity, impressionistic colors, and an odd realistic way of treating old medieval themes. Perhaps you have seen some of their colorful paintings of aloof mysterious damsels, tall and very willowy, who, clad in white and scarlet, wander through spacious gardens of lilies, sunflowers, and apple blossoms.

In 1859 Morris came out of this remote dream-world in which he had been trying his hand at poetry, architecture, and painting, and married Jane Burden, a noted beauty whom he had often painted. Not wanting any of the fashionable clumsy overtrimmed gilded and befringed house furnishings for their home, this true lover of beauty began to design his own. As a result of this, Morris, Burne-Jones, Rossetti, and others founded an establishment for making artistic household furniture (Morris chairs, etc.), and beautifully designed and colored curtains, rugs, tapestries, wall-papers, and even stained glass windows. Morris, a "master artisan," threw himself heart and soul into this work, and with the artist's insight, the craftsman's skill, and his own amazing patience and industry, refined popular taste and stimulated a truly national love of the beautiful in the common things of daily life. To him we chiefly owe the artistic revolution which banished the cheap and vulgar ostentation of mid-Victorian furniture and decoration.

Later at his famous Kelmscott Press at Hammer-smith he turned out many beautifully printed and illuminated books. Among these were a number of his own; for Morris all his life was a writer of fluent and often beautiful poetry and prose. In his later years Morris came more and more to realize that the social world was "out of joint" and did what he could to "set it right" and make the world more beautiful for all. He became an active Socialist and preached the gospel that work that brought no joy was fit only for slaves. When at the age of 62 this vigorous and charming personality was overtaken by death, his body was borne to the little Kelmscott churchyard in an open haycart decked with vines and bulrushes.

Among Morris' works are: 'The Defence of Guenevere' (1858), a book full of picturesque ballads; 'The Life and Death of Jason' (1867); 'The Earthly Paradise' (1868–70), a volume of dreamy romantic narrative poems on classic and medieval themes; 'Sigurd the Volsung' (1876), an almost epic poem taken from Icelandic sources; 'Love is Enough' (1872), a mystery play; 'The Well at the World's End' (1896), one of a series of remarkable prose romances; and 'News from Nowhere' (1890), a romantic pastoral.

**MORSE, SAMUEL F. B.** (1791–1872). "I wish that in one instant I could tell you of my safe arrival, but we are 3,000 miles apart and must wait four long weeks to hear from each other."

Samuel Finley Morse, a 20-year-old, homesick boy, wrote this sentence in a letter to his mother in 1811. She was in the house in Charlestown, Mass., where he had been born, and he had gone to London to study art. Perhaps it was at the moment of writing that letter that young Morse first conceived the desire

to bridge space with flying words—a desire which was later to give the world the electric telegraph.

His life was one long record of courage, integrity, patience, and faith, of poverty and struggle nobly endured in the pursuit of worthy ends. His father was a noted Congregational minister of Charlestown, a man of high education who counted among his friends no less a person than General Washington. Young Morse was educated at Phillips Academy and Yale. Courteous, studious, with his father's dignity and his mother's gracious manner, he commended himself to teachers and students alike. He showed a deep interest in chemistry and physics, especially in electromagnetism; but art was his chief concern.

It was a keen disappointment to his father when his eldest son chose to be an artist, for art in New England was looked upon at that time as a frivolous pursuit. Long years of struggle followed, but recognition came at last, and at the age of 40 Samuel F. B. Morse occupied a high place in his profession in the United States.

#### Love for Science Triumphs

But all this time his love for science was struggling in the back of his mind. When in 1832 he was returning from Europe in the steamship *Sully* there happened to be several men who were interested in electricity. During a discussion one day Morse suddenly suggested: "If the presence of electricity can be made visible in any part of the circuit, I see no reason why intelligence may not be transmitted by electricity." As he sat on deck, he worked out his plan in a series of drawings and explained them to his fellow-passengers. With a few minor changes, the instruments he devised that day became the models for the ones he later patented and which are now in use the world over.

Morse arrived in New York, a successful artist, with commissions awaiting him, and a life of ease, honor, and wealth before him. But he chose to disappear into a little shop in New Haven, and live long years of poverty, obscurity, toil, and ridicule in pursuit of his scientific vision. He lived alone in his shop, sleeping on a cot, cooking his own food, often going hungry. In 1837 he applied for a patent on "The American Electromagnetic Telegraph," but the "wild scheme" was thought impractical by capitalists and business men.

#### Recognition Comes Slowly

He went to England, France, and Russia seeking aid for his invention, but failure met him at every step. After superhuman efforts he eventually induced the United States Congress in 1843 to appropriate \$30,000 to build a line from Washington to Baltimore. In May 1844, the first message was flashed over this wire. The text of this epoch-making message was: "What hath God wrought?" (See Telegraph.)

The inventor's labor of years was crowned with success. He was then 53 years of age. Seven years later the Western Union Telegraph Company was organized, and St. Louis was connected with Buffalo

by wire. From that time on the growth of the electric telegraph was rapid. Although other men of science, both before and after 1837, in Europe as well as America, worked at the problem, Morse's system is the basis of most land telegraph systems to the present day. The code of dots and dashes now generally used is still known as the "Morse code" in honor of its inventor. The first attempt to lay a cable across the Atlantic was made in 1857 by Morse and Cyrus W. Field. Four cables parted, but the fifth was successfully laid in 1866. (See Cables, Submarine.)

As the inventor's fortune increased, he built a villa at Locust Grove on the Hudson. He surrounded himself with books and pictures and extensive gardens and his home became famous for its gatherings of distinguished men and women. His death in 1872 was an occasion for national mourning.

**MOSAIC** (*mō-zā'ik*). Nothing shows better how men love the beautiful than their efforts to make the floors, ceilings, and walls of their homes and temples, even the pavements, artistic. This may be seen best in mosaic work, which consists of designs in colored stones or glass made by the use of small pieces fitted together and held in place by cement. The pattern or picture becomes thus practically indestructible. This art was known to the Assyrians and Egyptians and flourished during the palmy days of Rome. It was revived later, especially for churches; and came into great popularity again in Italy during the middle of the 13th century.

There has been a revival in modern times and the demand for mosaic is steadily increasing. Italy still produces some of the most beautiful mosaics, but American artists and studios have achieved distinction, and some of the finest designs ever produced are to be found in American buildings.

Florentine mosaic, used chiefly for jewelry, personal ornaments, and paper-weights, is composed of shells or stones of natural colors cut in much larger pieces than are employed in Roman mosaics.

Tesselated mosaics, used chiefly in floors such as the famous one uncovered at Pompeii, are made of small cubes of marble, glass, or terra cotta nicely fitted together.

**MOSCOW** (*mōs'ko*). "Holy Mother Moscow" was the center about which the old Russian empire grew up. Now it is the capital of the vast Union of Soviet Socialist Republics, and also the capital of the Russian Socialist Federated Soviet Republic, a unit of the U. S. S. R.

To the Russian millions Moskva, as it is called in Russian, is no longer "Holy Mother," because of the anti-religious drives of the revolutionary leaders. The old walled monasteries, the hundreds of churches with their bright and bulbous domes, the turreted palaces, the myriad bells that pealed their devout hymns at evening—these gave Moscow its individuality. But most of the churches now have been converted to other uses, or torn down to make room for new buildings, and bells now play revolutionary songs.



## MAY DAY PARADE IN RED SQUARE



Nowhere else in the world is there a sight like Moscow's Red Square on May Day. The great square, which had its name "Red" generations before the Russian Revolution, is a scene of colorful pageantry on this holiday. The dull clothing of the crowds of working people is accented by the scarlet banners they carry. The red granite of Lenin's tomb, on the right, stands out against the pale pink brick wall of the Kremlin. At the end of the square looms the ancient Cathedral of St. Basil, multicolored and gilded, with domes like giant tulip bulbs. This is now a museum.

The tower at the right rises over the Spasskiye Gate, or Gate of the Redeemer, which was built in 1491 as the main entrance to the Kremlin. All passers-by were once compelled to uncover their heads before the sacred images in this gate. The old Russia and the new meet in Red Square. Here at the crossroads of important trade routes was a great market of the Middle Ages. Red Square saw the murderous raids of Tatar hordes in the 16th century, the bloody battles of the October 1917 revolution, and the falling bombs from German airplanes in the second World War.

There are business blocks of 11- or 12-storied skyscrapers built in the bold, rectangular German style, and on the outskirts are row after row of modern buildings to accommodate the tremendous increase in population since the Revolution. However, Moscow still has many of the towers and bulging domes which make it look like a dream city.

Dominating the city are the pink walls and battlements of the Kremlin. The word *Kremlin* means citadel. It is an imposing city in itself—a large triangle inclosed in walls about 65 feet high. There are 19 towers and 5 gates; the loveliest, perhaps, is the Gate of the Redeemer, which in the old days was a shrine no man might pass without removing his hat. In this tower the bells of a clock strike the hours, and twice each day ring out the worker's song, the now famous 'Internationale'.

The Kremlin once was sacred ground. It was the legal residence of the czars, and the Vatican of the Russian church. Now it is the seat of the Soviet government, whose officials reside in the former imperial palace. The entrances are guarded, and no visitor may enter without special permission. Within is a crowded array of historic cathedrals and convents, sacred relics, big guns and cannon, tombs, and priceless collections of jewels, works of art, and tapestries.

East of the Kremlin is the Kitai Gorod, or Chinese city. It is so called, not because Chinese live here or ever did, but because the Mongols built the wall surrounding it. Next to the Kremlin, it is the most ancient part of Moscow. It was once the residence of the merchants, just as the Kremlin was the residence of the aristocracy. Red Square, which was called

"Red" long before Russia became "Red Russia," is in the Kitai Gorod. For centuries the square has been the center of Russian political events. It was repeatedly used as a camp by the Mongols, was a forum and place of execution under the Russian monarchs, and under the Soviet government it is a

center of revolutionist demonstrations and processions. Its buildings are occupied chiefly now by government offices. Dominating the square is the squat, strangely imposing Lenin mausoleum, where crowds of shabby working folk wait in lines to view the khaki-clad body of their leader in its crystal casket. The top of the mausoleum is used as a rostrum for revolutionary orators. Three of the principal streets meet here, as do most of the city's bus and street-car lines.

One of the most noteworthy buildings in the square is the Cathedral of Saint Basil, built by Ivan the Terrible in the 16th century. Legend says the Czar had the architect blinded so that he could never reproduce its 12 painted domes, some twisted, some scaled, each topped with a heavy cross. It is now a museum.

Moscow guards everything of educational or artistic value. It has many museums which children visit regularly. Homes of the former aristocracy have been converted into schools, hospitals, or day nurseries; and the city boasts of its progress in reducing illiteracy, mortality, and disease. It is proud, too, of its artistic productions—its lavish opera, ballets, and the drama of its Moscow Art Theater and Great Academic Theater.

Always an important center of trade, Moscow is now a meeting point of the great Russian rail lines

#### WITHIN THE HISTORIC KREMLIN



Conspicuous among the old and famous buildings within the Kremlin inclosure is this great tower building of Ivan Veliky, built in the 17th century. Within are many bells, one of which weighing nearly 65 tons used to be rung when a new czar ascended the Russian throne. But this bell is a dwarf compared to the one you see standing in front of the tower—the Czar-Kolokol (Emperor of Bells), which weighs about 200 tons. It was broken in a fire before it could be hung, and its voice has never been heard.

and of air routes connecting with the principal cities of Europe and the Orient.

The city's history dates back to the 12th century. The burning of the city in 1812 forced Napoleon to begin his disastrous "retreat from Moscow." It was the capital of all Russia from the 15th to the 18th century, when it was succeeded by St. Petersburg, later called Petrograd, and now Leningrad. Population, more than 4,135,000.

**MOSES.** Among all lawgivers, there is one supreme name, that of Moses, the great leader and lawgiver of the Hebrews. The story of his life as told in the Bible is full of wonders. In the land of Egypt where his people were held as slaves, the cruel pharaoh

people away from the idolatry that they had learned from the Egyptians to a purer faith and a higher moral order. In these simple commandments are the fundamental elements of all moral law, and they have had a tremendous influence not only on the Jews, but on mankind as a whole. They form the ethical standard today of the whole civilized world.

Moses, who had led the people for 40 years in the wilderness, did not live to see them established in the Promised Land, but through the laws which he gave them and the ideals he held before them, the little wandering band of shepherds was transformed into a nation, destined to bring moral and spiritual light to the world.

#### PHARAOH'S DAUGHTER AND THE INFANT MOSES



Everyone knows the story of how Moses' mother hid him in the bulrushes in order to save him from the death decreed for all male-children born to the Israelites, and how Pharaoh's daughter found him. Here we see the kind-hearted Egyptian maiden gazing upon the future law-giver of the Jewish race, and directing that he be cared for. Little did she suspect that this infant would one day defy the power of Egypt and lead his people out of bondage.

ordered that every male child born to the Hebrews should be cast into the Nile. But Moses' mother put her little son in a box made of bulrushes and laid it in the reeds by the river's brink. The pharaoh's own daughter found him there and cared for him. Thus Moses was saved for his destined work of delivering his people from oppression and founding a nation.

From Egypt Moses led his people through the Red Sea and the desert wilderness to Mount Sinai. Here, according to the Biblical account, amidst flashes of lightning that enveloped the mountain in a blaze of fire and thunders that shook the earth, God gave to Moses the Ten Commandments, written upon two tables of stone. These laws, often called the *Decalogue* (from the Greek *deka*, "ten" and *logos*, "word"), formed the foundation of the civil and religious laws of the Hebrews (Exodus xx, 2-17). They turned the

Among the heroes of the nations, few exhibit such a combination of strength and spiritual nobility as Moses. He had the courage to defy the great pharaoh of Egypt, and yet he was "very meek, above all men that were upon the face of the earth." He led his people "as a father carries his child," and rarely did his patience desert him, though he was often tried by their stubbornness and folly. Enshrined in the memory of later generations, Moses was looked upon as the ideal prophet.

The first five books of the Bible, or the *Pentateuch* (meaning "fivefold") are sometimes called the five books of Moses, from the fact that their authorship was attributed to Moses. Among the Jews they are known as the *Torah*, or law, because they contain the Mosaic law. The story of Moses is told in Exodus, Leviticus, Numbers, and Deuteronomy.



## The MOSQUITO—Always a PEST, Often a KILLER

**M**OSQUITO. To most of us, mosquitoes are just annoying. But throughout the ages some of these little insects have been deadly enemies of mankind, spreading malaria, yellow fever, and other diseases.

Certain scholars believe that malaria, by sapping the strength of the people, started the downfall of the ancient Greek and Roman civilizations. We know that it took heavy toll among pioneer Americans and continues to afflict millions of people in hot damp countries. Yellow fever, born in the mosquito swamps of tropical coasts, held back the colonization and development of new lands, and spread death even into temperate regions.

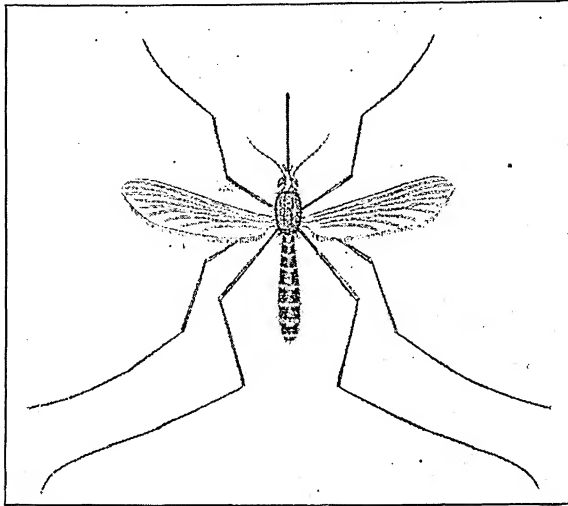
Until the beginning of the 20th century, however, the mosquito's deadly rôle was not recognized. The detective work that exposed its responsibility and made possible a successful fight against these diseases was one of the great chapters in the history of science. Americans can be proud of this achievement, because their army led in the attack and won the fight.

This thrilling story can best begin with the mosquito itself, how it lives and how it spreads disease.

### Life of the Mosquito

The mosquito leads an *amphibious life*, the first part spent in water and the rest on land and in the air. It begins when a female lays eggs on the surface of stagnant water. Larvae or "wigglers" soon hatch out and swim around, seeking tiny bits of food. Those of most species must come to the surface for air. Soon they change into pupae, or "tumblers"; and presently each pupa becomes a grown insect and flies away.

Development from new egg to adult may take as little as 9 to 14 days, depending upon the species. Dry or cool weather tends to prolong the period. Through cold winters eggs lie dormant; so do the fertile females of some species. The ac-



A female mosquito of the species *Culex pipiens*, four times enlarged. This is the common house mosquito of the northern states.

tive life of a female may last from ten days to a month or more, during which time she will lay several batches of from 50 to 200 eggs.

The mouth parts of the mosquito are exquisitely designed for sucking juices. To the eye, its "beak" looks like a single thin tube. Actually it consists of a sheath, enclosing saw-tipped daggers, an injection tube, and a sucking tube. These parts are not fully developed in the male mosquito, which feeds only on plant juices. The female is the one that bites, and though

she can live on plant juices, she greatly prefers blood. To get it, she settles upon a victim, selects a likely spot, and starts sawing through the skin. Into the puncture she then injects a bit of saliva. This keeps the blood from coagulating. Lastly, she sucks up a meal of the prepared blood and flies away. The itching of a mosquito bite is caused chiefly by the injected blood solvent. It will be worse, therefore, if the insect is driven off or killed before it has a chance to suck back the irritating liquid.

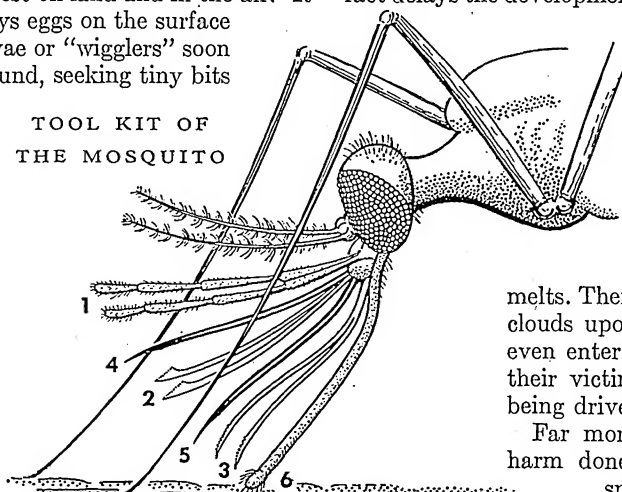
Mosquito bites and the later itching can be bad enough to destroy all pleasure in being out of doors. People tend to shun mosquito-infested places. This fact delays the development of many areas. In the far

northern regions of Canada, Alaska, and Siberia, mosquitoes reach their highest peak as pests. There mosquito eggs live through the winter in the snow, and the insects hatch out in prodigious swarms when the snow

melts. Thereafter they descend in dense clouds upon any animal or man, and even enter the nostrils and mouths of their victims. Tales are told of men being driven insane by them.

Far more serious, however, is the harm done by the mosquitoes that spread diseases. This is accomplished by biting well persons after having bitten sick ones. The germs or virus of the diseases in ques-

### TOOL KIT OF THE MOSQUITO



The parts of her slender beak are spread out here for identification. They are numbered in order of use: 1, the palpi that find the exact place to bite; 2 and 3, the saws that cut an opening in the skin; 4, the tube that injects saliva into the wound; 5, the tube that draws out the blood; and 6, the sheath in which saws and tubes are enclosed when not in use.

tion are drawn in with the blood of the sick and later the germs are injected with the mosquito's saliva into the new victim. It must be said that the mosquitoes gain no advantage whatever from this deadly traffic. They are merely used by the germs as a sort of halfway house.

#### How Mosquitoes Spread Yellow Fever

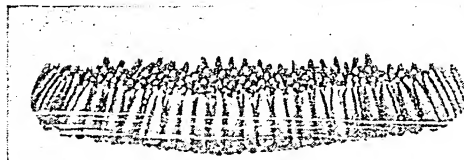
The details of the transfer are relatively simple in the case of yellow fever. This disease is caused by a virus in the blood of men and animals which seems to undergo little change in the body of the mosquito. The species of mosquito chiefly responsible for carrying the disease from one human being to another is *Aedes aegypti* (formerly called *Stegomyia fasciata*). But other species are known to transmit the virus, and when a mosquito has bitten an infected man or animal, its bite remains infectious throughout its life. Among the jungle animals of tropical America found to be susceptible to yellow fever are monkeys, opossums, ant-eaters, sloths, armadillos, and several kinds of rodents. It appears among them usually in very mild form, but when mosquitoes transmit their virus to human beings the effects can be just as disastrous as when they transmit it from man to man.

Yellow fever attacks the liver, kidneys, and digestive tract, producing intense fever and jaundice. The resulting yellow color of the skin gives the disease its name. Within a few days, from 50 to 90 per cent of the victims die. Those who recover are thereafter immune. Children are more likely than adults to survive the disease.

#### Complex Story of the Malaria Mosquito

The transmission of malaria by mosquitoes is a much more complicated process. This dis-

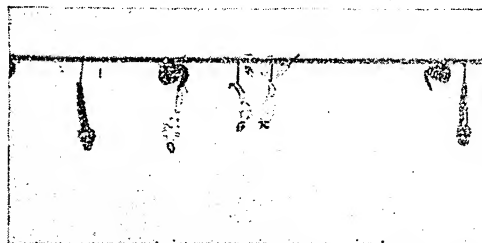
#### LIFE STORY OF A MOSQUITO



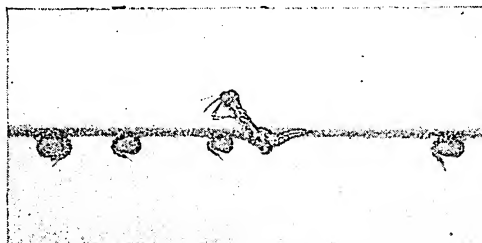
This raftlike mass is a cluster of mosquito eggs, greatly enlarged, floating upon the surface of a pond, and ready to produce mosquito larvae.



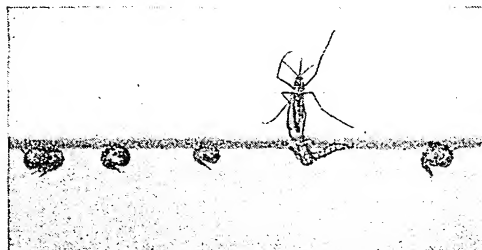
Here are several newly hatched larvae, diving into the water. They are water animals, feeding upon the minute organisms of various sorts, but they must come to the surface to breathe.



Here are several larvae becoming pupae. At the left is a larva. Next comes a pupa, with the empty larval skin attached, then two empty skins, a pupa, and another larva.



This view shows a newly formed adult mosquito crawling out of its pupa skin which floats like a little boat on the surface of the water.



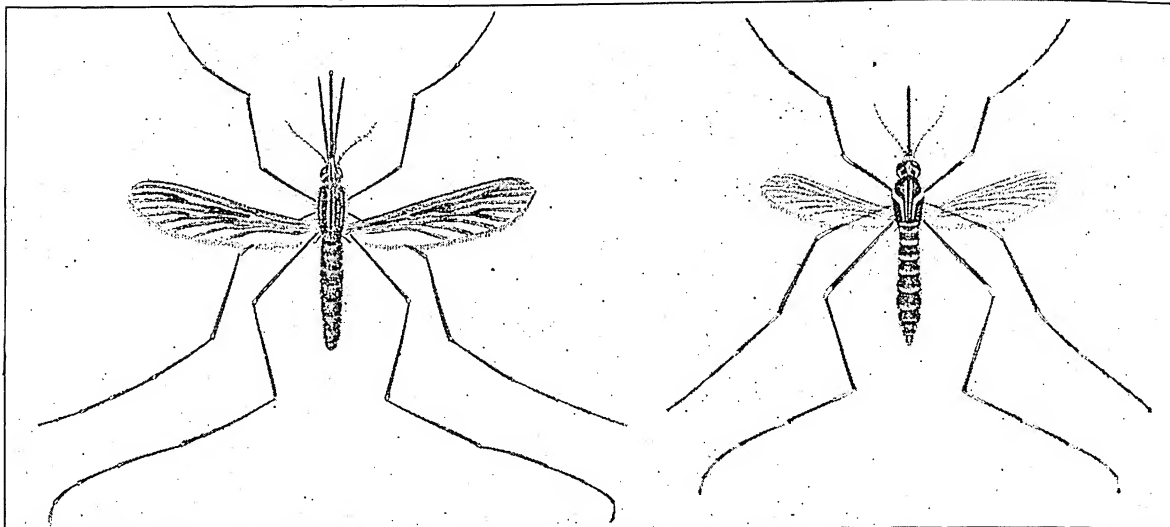
Before starting on its bloodthirsty hunting life, the mosquito is stretching its legs, drying its wings, and gathering strength for its first flight to land.

ease is caused by microscopic parasites of the genus *Plasmodium* (see Protozoa). In their life-cycle these parasites must pass through several stages and transformations. Half of these transformations can take place *only* in the bodies of men; the other half, *only* in the bodies of mosquitoes. Thus, while yellow fever could be transmitted from man to man by a simple transfer of virus, using, let us say, a hypodermic needle, malaria absolutely requires the intervention of a mosquito. And the mosquito must be of the genus *Anopheles*.

What happens is this: When the *Anopheles* mosquito bites a person afflicted with malaria it draws into itself with the blood some of the malaria parasites in their sexually reproductive stage (*gametocytes*). In the digestive tract of the mosquito these unite and produce egglike cells which burrow to the outer side of the mosquito's intestinal wall. There they change into a threadlike, free-swimming form (*sporozoites*) and make their way up to the mosquito's saliva glands. In mosquitoes other than the *Anopheles*, the parasites are prevented by protective juices from boring through the intestinal wall, and so are destroyed.

When the infected *Anopheles* next bites a human being and injects saliva into the wound in the manner already described, some of the free-swimming malaria parasites are carried across. At once each of them burrows into a red blood cell of the new host. There it grows and divides until it forms from 8 to 32 new parasites (*merozoites*). These burst out of the blood cells, bore into new cells, and repeat the process of growth and division. Within 6 to 15 days after the mosquito bite, waves of about 150 million parasites at a time are breaking

## TWO DANGEROUS DISEASE CARRIERS



The female *Anopheles quadrimaculatus* at the left is the common American malaria carrier. She has four large spots on each wing. The female of *Aedes aegypti*, shown at the right, carries yellow fever. On her dark back is a distinctive lyrelike pattern.

out of blood cells at more or less regular intervals. As they do so, they release poisons into the blood stream. This is what brings about the periodic fevers and chills characteristic of malaria and which used to be called "ague fits."

There are several types of the *Plasmodium* parasites. Some take longer than others in their development in the blood cells, and this accounts for the difference between "tertian" malaria with attacks reaching their peak every 48 hours; "quartan" malaria, with attacks every 72 hours; and other variations of the disease.

Within 10 to 14 days after the first attack, a new generation of sexually reproductive parasites develops in the blood stream of the victim. Thus he is ready to infect the first *Anopheles* that bites him, and so create another possible link in the chain of disease.

Mosquitoes also spread an infective form of elephantiasis. In this disease some part of the body, commonly a leg, swells to gigantic proportions, because the infecting agent, a round worm, blocks the lymphatic vessels. Mosquitoes spread this parasite by contaminating water when they lay their eggs. Dengue, or "break bone fever," is still another mosquito-

borne disease. It is common in the tropics, and while rarely fatal it is accompanied by intense muscular pains and eruptions of the skin.

## How Mosquitoes Were Found Guilty

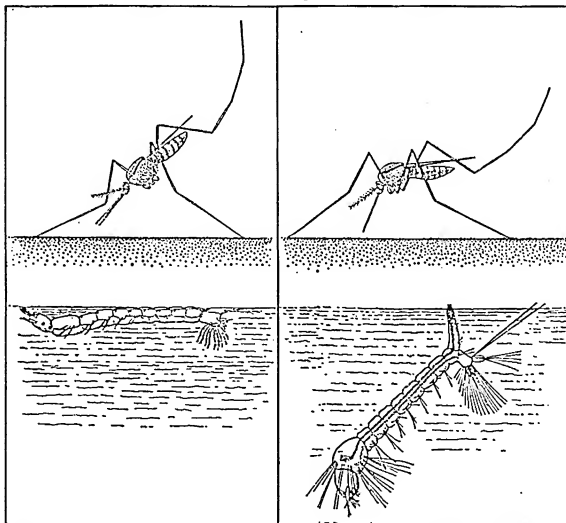
Throughout most of history men suffered from mosquito-borne diseases without being able to do much about them. They recognized some regions as dangerous, especially in certain seasons, and avoided them. After the Spaniards conquered Peru in the 16th century, they learned that quinine, obtained from the cinchona tree, could cure malaria (see Quinine); but

until men found out the part played by mosquitoes in the spread of these diseases, little progress could be made in checking them.

In the middle of the 19th century, Pasteur and others had proved that certain diseases are caused by living organisms that gain entrance into the bodies of men and animals (see Germ Theory of Disease). All infectious diseases were promptly restudied from this point of view, and in 1880 Charles L. A. Laveran, a French army doctor, discovered the malaria parasite in human blood.

The first scientifically based suspicion that mosquitoes might be guilty of spreading disease came in 1881 from Carlos Juan

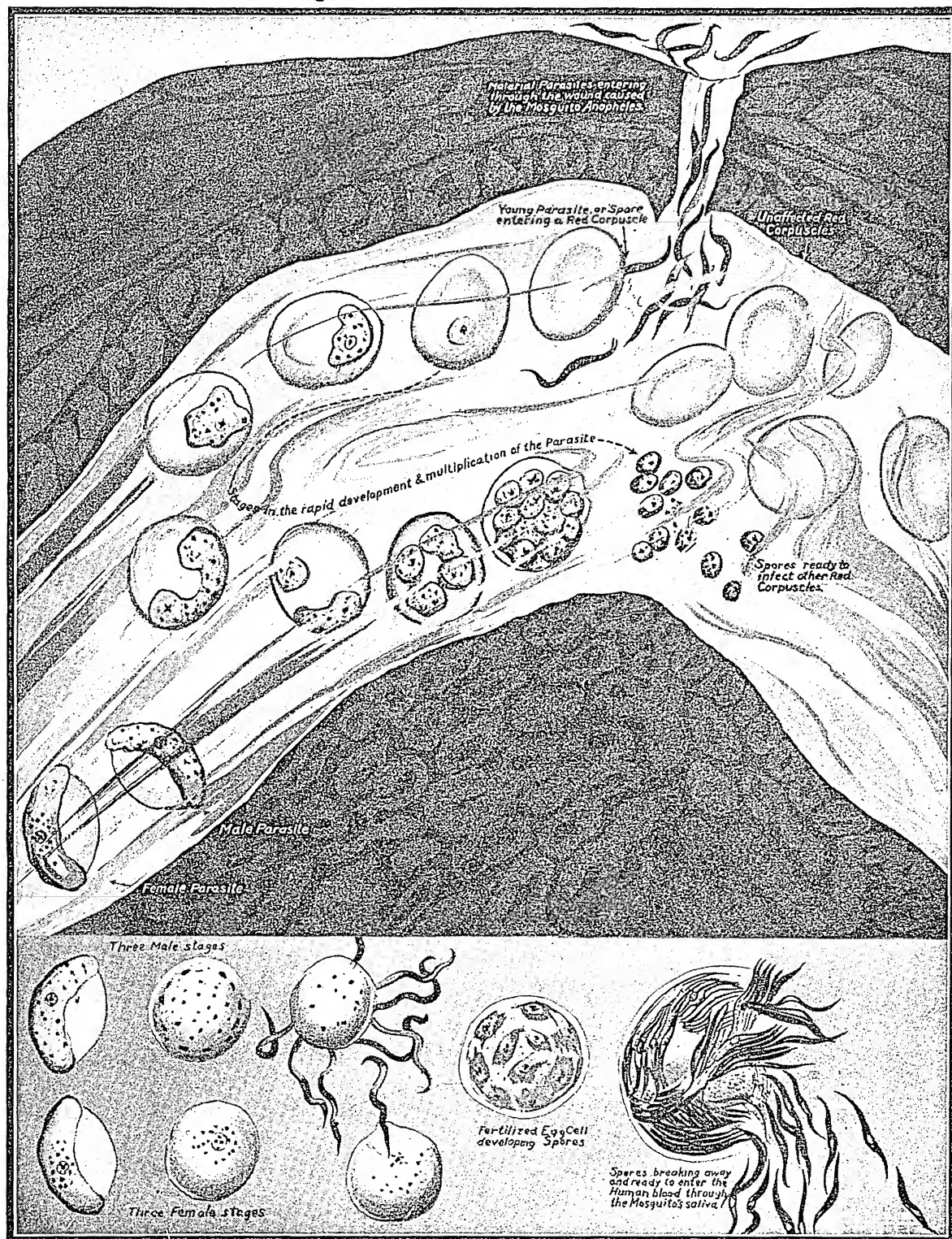
## THE TWO MOSQUITO TYPES



Characteristics of the anopheline type of mosquito, which includes the malaria carriers, are shown at the left. When at rest or biting, the members of this group seem to be almost standing on their heads. The larvae lie in the water parallel to the surface. The culicine type, which includes the common house mosquitoes as well as the yellow fever carrier, is shown at the right. Members of this group stand with body parallel. The larvae, however, hang down in the water at a slant.



## HOW MOSQUITOES SPREAD MALARIA



The picture shows a much enlarged section of human skin. At the top is a hole caused by an *Anopheles* mosquito's bite, leading into the blood stream. In it are malaria spores, with one of them entering a red corpuscle. The next three corpuscles to the left show the spores developing. Below these are corpuscles illustrating the two phases in the life of the parasites. Some spores divide and form round bodies which attack other blood corpuscles creating the symptoms of the disease as shown along the dotted line. Others develop into crescent-shaped bodies, which are taken up by the bite of another mosquito. Below we see the changes which the malaria germ undergoes in the second mosquito's body, finally developing the spores which will infect another human victim.

Finlay, a Scottish-French physician, living in Cuba. He suggested that mosquitoes were responsible for transmitting yellow fever; but he could not prove it, and his theory received little attention.

Meanwhile, studies of the malaria parasites were carried on intensively, and in 1897-98 Maj. Ronald Ross of the British Army in India was able to demonstrate that the *Anopheles* mosquito carries the disease.

In 1900 the United States Army, which had occupied Cuba after the Spanish-American War, appointed a commission to study the yellow fever epidemics that ravaged the island. The members of the commission were Walter Reed, Jesse W. Lazear, James Carroll, and Aristide Agramonte. In the blood of the victims they could find no such organism as the malaria parasite. The yellow fever virus was too small to be detected by the means then available. So the commission decided on heroic measures to test Dr. Finlay's 19-year-old theory. They would allow mosquitoes to bite yellow fever sufferers and then healthy men.

In the course of the early investigation, Dr. Carroll and Dr. Lazear were both bitten by the experimental insects, and Dr. Lazear died. But more exact proof was needed. One group of soldier volunteers used clothes, bedding, and utensils taken from yellow fever patients, but they were carefully protected against mosquitoes. None of these contracted the disease. A second group lived in the cleanest and most sanitary quarters, but each man was exposed to mosquitoes known to have bitten people who had yellow fever. All of these were stricken. Fortunately none of them died, but their heroism was undiminished by this fact. They had knowingly taken a mortal risk. As a result, the guilt of the mosquito was established beyond question, and men could now fight yellow fever intelligently.

Soon thereafter mosquito breeding places were wiped out in Havana and yellow fever disappeared. Colonel William Gorgas, who had charge of the clean-up, later did the same in Panama and so made possible the digging of the great canal (see Panama Canal). Today, with mosquito control and the use of yellow fever vaccine, the disease has been driven out of nearly all civilized communities.

#### Details of Mosquito Control

Mosquito control consists of destroying or nullifying their breeding places. All unnecessary gathering places for water, such as old tin cans and glass jars in vacant lots and blocked rain gutters on houses, are eliminated. Rain barrels and open tanks are screened. Swamps may be drained and water-holding underbrush is cut down. Lakes, reservoirs, and swamps

which cannot be drained may be covered with oil or other substance that either prevents the mosquito eggs from being laid or kills the larvae after they hatch.

Petroleum is effective, but it also kills fish and water plants. A mixture of pyrethrum powder mixed with a light oil and soapsuds is preferred. A powder containing Paris green dusted over remote waters by low-flying airplanes is effective against *Anopheles* larvae, which, unlike most other mosquito larvae, will eat this poison and die.

Mosquitoes are also attacked by stocking their breeding waters with small fish. The top minnow (*Gambusia patruelis*) is useful in fresh water; so are young goldfish if they get no other food. In salt-water marshes, the killifish (*Fundulus heteroclitus*) is effective.

#### Mosquito Classification

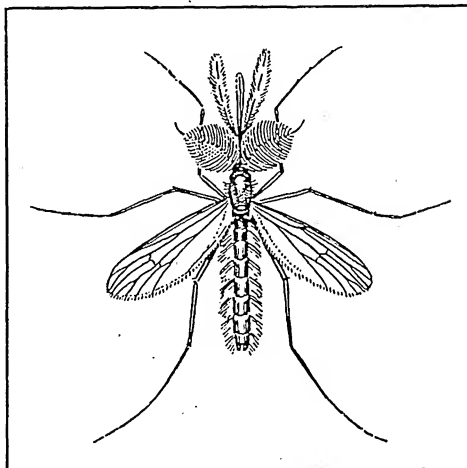
Mosquitoes belong to the gnat family (*Culicidae*) of the fly order (*Diptera*). They are grouped in two easily distinguished sub-families, the *Anophelinae* and the *Culicinae* (see the illustration on page 268).

The principal malaria carrier in the United States is *Anopheles quadrimaculatus*, which breeds in plant-filled waters and bites after dark. The yellow fever carriers are of the culicine type, and the best known is *Aedes aegypti*, which breeds near dwellings and bites in daylight. The common house mosquitoes of the United States are *Culex pipiens* in the north and *Culex quinquefasciatus* in the south, both night biters.

**MOSS.** The mosses which form beautiful green carpet-like expanses on the forest floor, or appear like brilliant green rosettes on decaying logs, wet boulders, and dripping cliffs in our ravines and gorges, are masses of very small plants, each of which by itself resembles a tiny tree, with a single straight trunk and tiny delicately formed leaves growing out from it all the way from base to tip. Each moss plant is held in the soil and obtains its nourishment by means of a number of little threadlike roots, as is the case with the higher plants. Some mosses, instead of standing erect, trail over the ground like tiny velvety vines, which interlace and form a thick dense mat, like some heavy cloth. Mosses as a rule delight in moisture, and their habit of growing compactly together makes it possible to hold large quantities of water in storage (much as a sponge does), for use during dry periods.

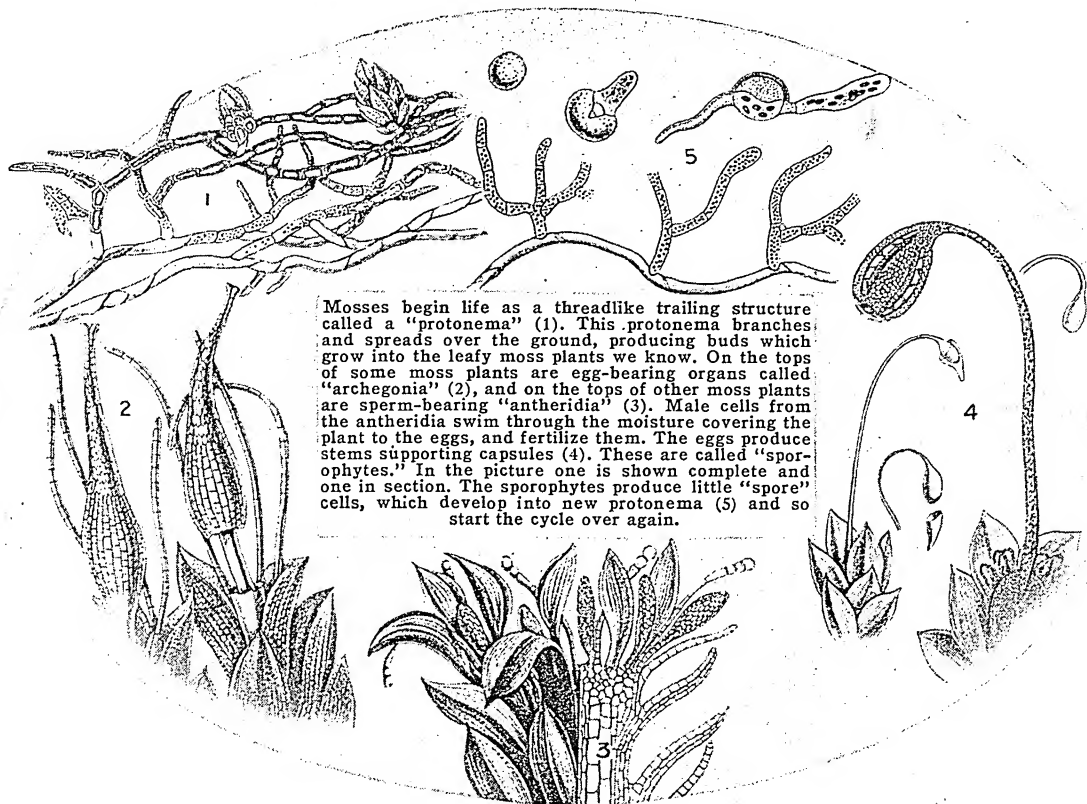
Mosses are called by botanists "flowerless" plants because they do not have the showy blossoms which we are accustomed to see on many of the higher plants. The process by which they reproduce is very curious. Each moss plant grows up from a tiny green threadlike trailing structure, known as the *protonema*; this sends up little buds here and there, which develop into the moss growths with which we

THE BADGE OF A MALE



Male mosquitoes have plumelike antennae, which serve as ears to locate the humming females. The male shown here (*Culex pipiens*) is enlarged six times.

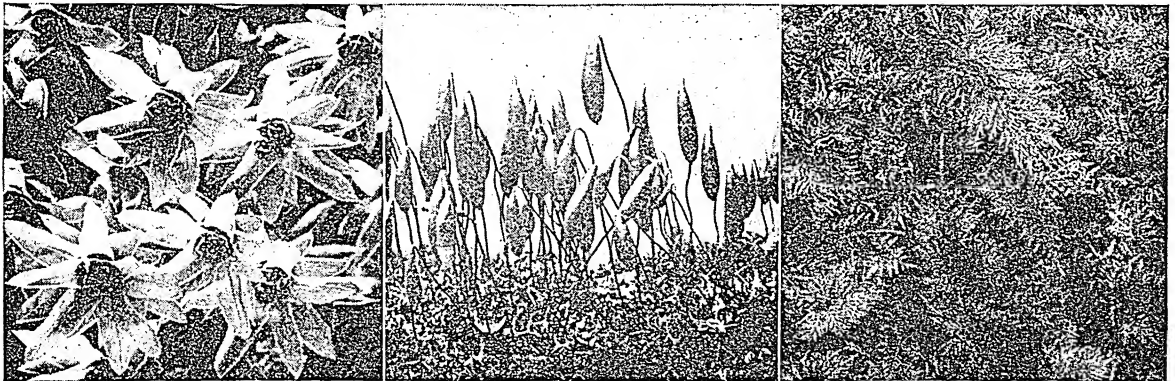
## THE CURIOUS LIFE CYCLE OF MOSS



are familiar. In the tips of some of these moss plants grow structures called *archegonia*, in which eggs develop. In other moss plants grow still other structures, called *antheridia*, in which are developed little free-swimming cells, called sperms. When the moss plants are covered with a film of water, the little sperms go swimming, by means of little hairlike appendages (called *cilia*), over to the archegonia and there fertilize the eggs. From the egg there then grows another sort of plant, which, curiously enough,

takes root right in the top of the archegonial plant where the egg was developed. This plant is known as the *sporophyte*. At the top of this sporophyte there grows a little case which contains spores. Spores are somewhat like the seeds of higher plants, but they are very minute, so that a mass of them together resembles a little cloud of dust. When the sporophyte is ripe, the little case at its tip opens, and the spores are scattered about by the wind. From each spore there grows a new protonema, completing the cycle.

## BEAUTIES IN A BIT OF MOSS



If you look at moss under a magnifying glass you will see that it is far more than a carpet of green woolly stuff. Sometimes it has beautiful flowers, as shown by *Mnium hornum* to the left. Or perhaps you may discover a curious "fruit," such as that on *Bryum capillaris*. Still other mosses look like a tangled forest such as *Hypnum tamariscum* on the right.



Mosses are often confused with the liverworts, which also grow in damp situations, like the mosses, and are of the same delicate green color (see Liverworts). Most of them may be distinguished from the mosses by their thicker leaves, which look rather soft and fleshy and which usually lie flat on the ground, with little hairlike rootlets on their under surfaces. "Irish moss" is not a moss, but a seaweed, and "Iceland moss" is a lichen. The so-called "moss" on trees is mostly *lichens* (see Lichens). "Florida" or "Spanish moss" is a flowering plant.

#### The Many Kinds of Mosses

Some 5,000 species of mosses are known, distributed all over the world. Nine-tenths of them belong to the family *Bryaceae*. The other chief group, the sphagnum or bog mosses, is of considerable value to man. Their pale spongelike leaves filled with hollow cells absorb liquids with great rapidity and hence make an ideal surgical dressing with which to pack wounds. Large quantities were used for this purpose in the World War of 1914-18. The sphagnums grow in large patches in damp meadows, bogs, and swamps. When they occur along the shores of a lake or pond, they often gradually fill up the whole area with their spongy growth. Such a filled-up pond is called a quaking bog, because, like some enormous sponge, it trembles and quakes when one walks upon it. Growths of sphagnum accumulating through thousands of years formed the deposits of peat found in England, Ireland, and other countries (see Peat).

At the present time mosses seem rather humble members of the plant kingdom. But they played a great part in making the land fit for animal habitation. After the most primitive plants (algae and fungi) had carpeted the bare rocks and by heaping up their dead bodies provided a little store of nutritive soil, the mosses and liverworts appeared and took up the work. In time their remains provided a rich soil and thus made possible the growth of higher plants. The mosses and the higher plants together formed the material which supported animal life on land. Mosses still exercise this regenerative function when great catastrophes, such as the eruption of Krakatoa in 1883, strip the land bare of life.

The mosses belong to the division *Bryophyta*, a Greek word signifying "moss plants." This contains two classes, the class *Musci*, or true mosses, and the class *Hepaticae*, or liverworts. Two species of sphagnum common in North America are *Sphagnum compactum* and *Sphagnum acutifolium*.

**MOTHER GOOSE.** Who was Mother Goose? Nobody knows, yet everyone of us is acquainted with her rhymes. A widely circulated story declares that the original Mother Goose was a certain Elizabeth Goose (or Vergoose), a Boston widow. It is claimed that she sang these ditties to her infant grandson, and that the lad's father, who was a printer, published them in a book at Boston in 1719. No trace of such a book, however, has ever been found, and long before that date the name "Mother Goose" was used in France in connection with various stories and myths of a folklore character.

The first mention of this French "Mother Goose" is found in an old French poem of 1650:

But the joyous theme in use,  
Like the tale of Mother Goose,  
In myth and fable so abounds  
It quite bewilders and confounds.

In 1679 a French writer named Charles Perrault published a book of fairy stories under the title 'Tales of Passed Times, by Mother Goose'. It contained such stories as "The Master Cat" (our "Puss in Boots"), "Little Thumb" (our "Hop o' My Thumb"), "Sleeping Beauty," and "Blue Beard." This book proved very popular and was soon translated into English. In this way the name "Mother Goose" became known to English children.

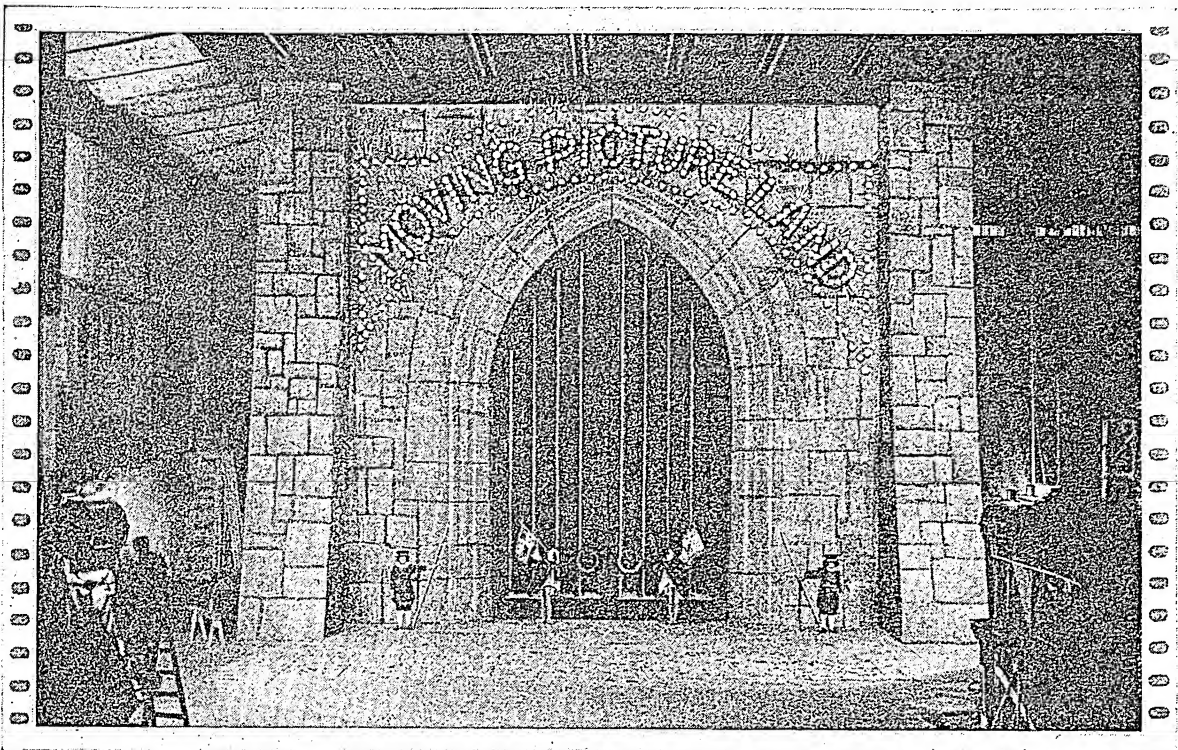
But many of the rhymes and jingles which make up our Mother Goose's melodies were already well known in England. Like all folk songs and sayings, they had been passed on from generation to generation. Finally, in 1760, a London publisher named John Newbery transferred the popular name "Mother Goose" from the fairy stories to a collection of these nursery jingles, and the rhymes have ever since borne the name of this mythical authoress.

No copy of this 1760 edition is in existence, but there is a reprint of it which bears the date of 1791. It is a tiny volume, about 2¾ inches long by 3¾ inches wide. It contains 51 rhymes, each furnished with a tiny illustration. The first American edition of Mother Goose was published in 1785, at Worcester, Mass. It is an exact reprint of the Newbery book. In 1833 a Boston publishing firm published an enlarged version, with more than twice as many jingles as were in the Newbery collection. Most of the new ones are evidently very very old. Many of them were probably copied from an English book, 'Gammer Gurton's Garland,' published in 1810.

#### What the Students Say About Them

Many learned men and women have given loving study to the history of these old familiar nursery rhymes. "Sing a song of sixpence," they tell us, is found in a play written in Shakespeare's time. "Jack Spratt" was a very fat churchman. "Little Bo-Peep" is an old, old children's game, in which one child shuts her eyes and the others hide from her. "Little Jack Horner," according to some, was an Englishman who secured a rich estate (the "plum") from the church in the time of Henry VIII. "Old King Cole" was a legendary British prince in the old Roman days. There was once a whole "chap-book," or early booklet, about "Simple Simon," and also about "Mother Hubbard." "Three blind mice" is found in a poem published in London in 1609; and "Tom, Tom, the piper's son," is in a song published in 1719.

So every one of these quaint jingles is seen to have its own special history; as we recite them we can think of the long long line of children, reaching back centuries and centuries, who have said these rhymes and played these games, and realize how very very old are many of the sayings, customs, and ways of living which still seem so natural to us today.



**MOTION PICTURES.** Within 20 years after the first blurred and flickering moving pictures danced on the screen before astonished spectators, about the beginning of the 20th century, the making of motion pictures had become a leading industry of the world, with a network of subsidiary industries. It had become an art as well, utilizing the talents of famous writers, actors, architects, sculptors, and designers, and employing hundreds of engineers and other technical experts. The silent picture was just becoming a masterpiece of science and art when the sound picture appeared, with music and dialogue, to revolutionize the industry. Then, while sound pictures were still in the experimental stage, pictures began to be shown in their natural colors. Meanwhile cameras and projectors had been developed which enabled the amateur to make and show his own pictures. The tourist started on his travels equipped with his movie camera, and happy parents, too, were recording the childish antics of their babies.

Only 20 years after the discovery of the method of taking snapshots of moving things, and ten years after the first length of celluloid film was manufactured, special cameras, methods of developing and printing, projecting apparatus—all the essentials for the silent motion picture—had been provided. Fortunes were being made in the industry in Europe as well as in the United States. An American company attracted world-wide attention by filming the first large production, 'The Passion Play', which furnished theater patrons an entire evening's entertainment.

Today the "movies" (called in England and some other countries "cinema" or "cinematograph" shows) entertain and educate millions of people, old and young, of every nationality and grade of intelligence, in every corner of the world. The inhabitants of the frozen north make long journeys on snowshoes and dog sleds to see an occasional movie, and no less ardent are the native movie "fans" in India, Africa, and other lands of the tropics. Pictures speak a universal language, so that films were easily exchanged between different countries until the development of sound pictures brought a world-wide demand for "talkies" in many languages.

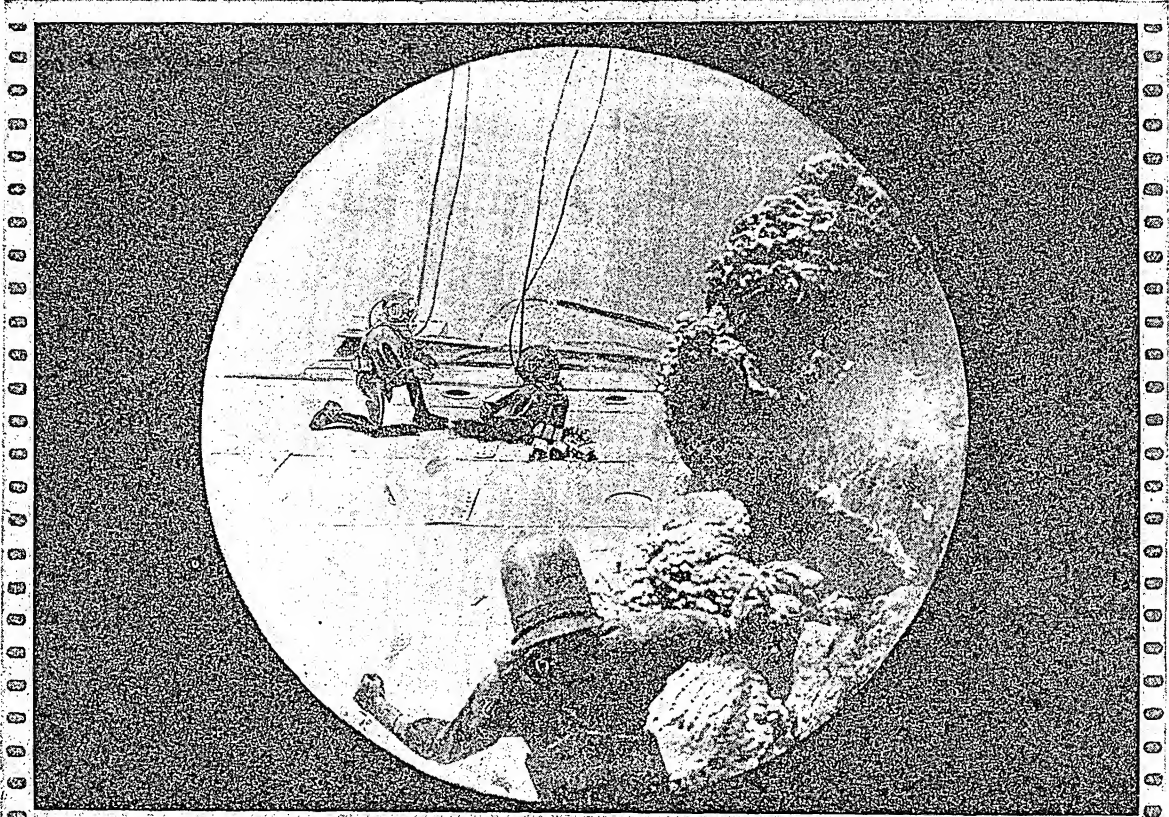
In the movies you watch curiously the people of other lands at work and at play; at the same time perhaps the black boys of Africa, the brown men of the Pacific islands, and Eskimos wrapped in furs are looking just as curiously at the people and scenes and customs of your homeland.

You see a history-making event that has just occurred in a distant land, or watch the development of a tiny seed as it sprouts, grows, throws out leaves and buds, and bursts into bloom before your very eyes almost before the most expert gardener would have had time to plant it. You sit in a darkened room and on the screen before your eyes a polar expedition makes its way over fields of ice and snow, and without enduring the cold and braving their dangers you see the sights that those bold explorers saw. An adventurous camera man climbs mountain peaks that few would have the necessary equipment, time, and

endurance to mount, and millions later on see pictured on the screen the steep passes, the deep crevasses, and the majestic landscapes spread out above the clouds. Up in the airplane, to look with the eye of the bird upon the panoramic view below, down into the deepest mine, into the bowl of a seething volcano, into the midst of the battle, goes

within range. In one undertaking of this kind the body of a horse was staked out on the bed of the sea to attract sharks into view, and when they appeared a native, accustomed to performing the dangerous feat, dived and dispatched one of the monsters with his knife, so that an actual fight between a shark and a man could be shown on the screen.

"THE HEART OF THE MOVIE" WITH A WONDERFUL SCENE



Here is one little picture, many times enlarged, from the long strip of film that is the center of all motion-picture work. No difficulty is too great for the camera men to tackle in getting scenes—not even when they are enclosed in a submarine chamber, photographing divers at work, as you see here. "The film is the thing" and in getting it, the highest ingenuity of Movieland is often needed.

the movie camera and brings back a faithful report of what passed before its rapidly blinking eye.

To supply the news films, operators are stationed all over the world watching for events of local or general interest, and their films are sent in to their news service bureaus much as reporters gather news for the daily papers. When something of unusual importance occurs, the films are dispatched with haste, developed, printed, and distributed with such speed that audiences in cities hundreds of miles apart may see views of a great fire before the ruins have ceased smoking.

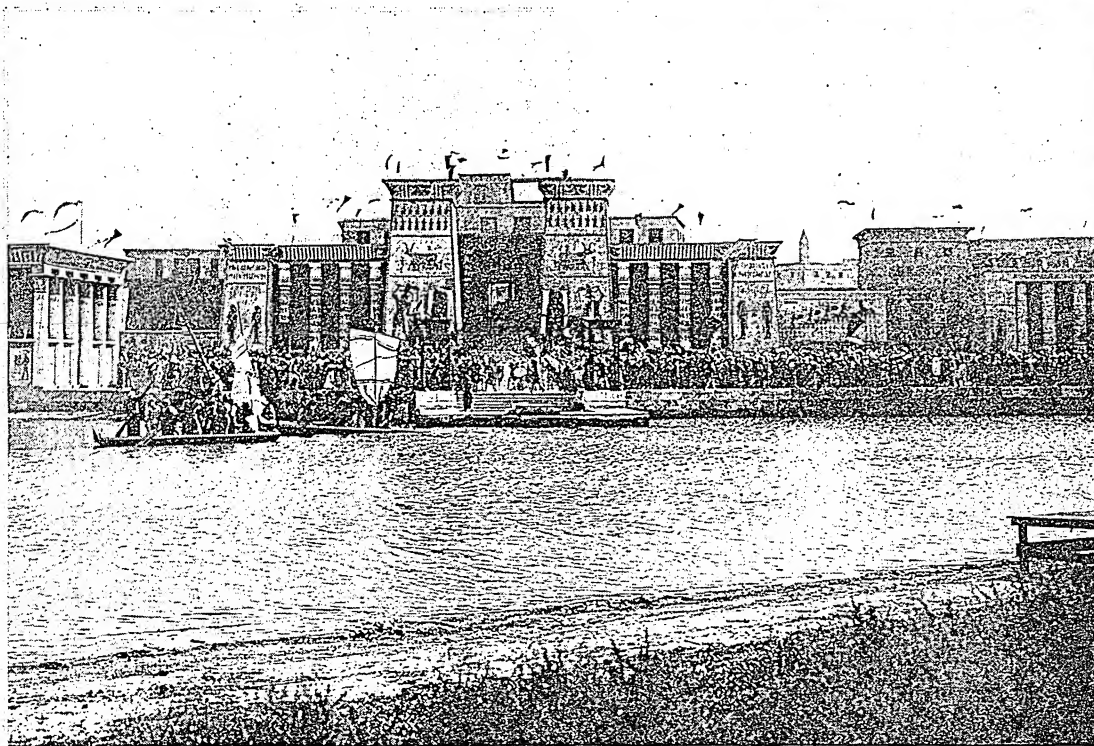
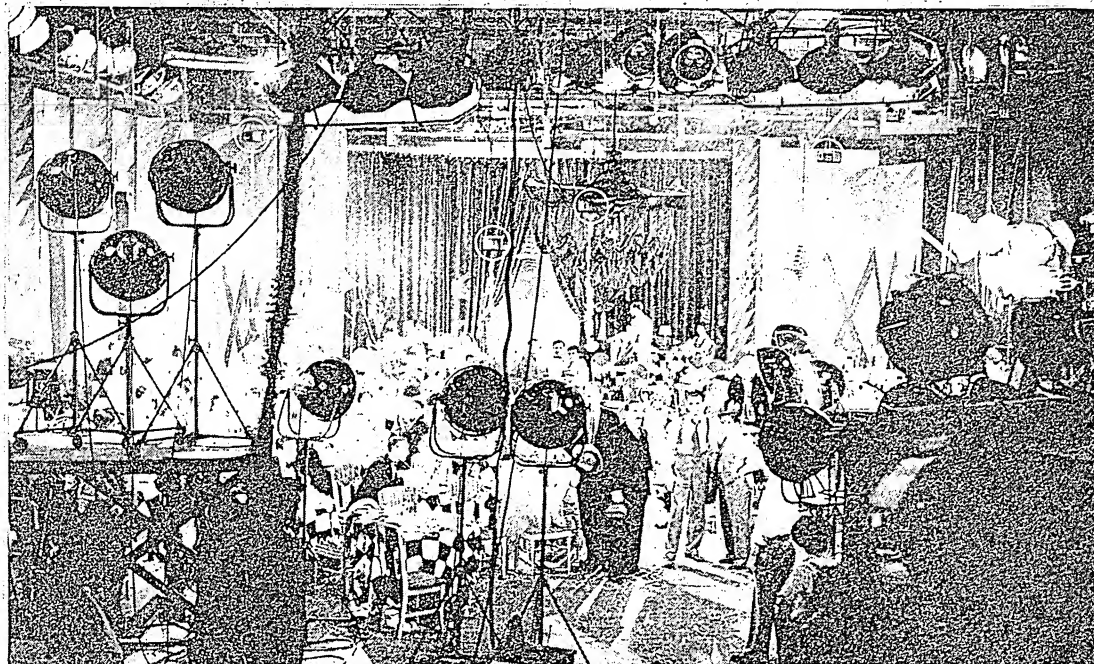
New fields are constantly being opened to the moving picture camera. For undersea pictures a specially constructed water-tight chamber is used in which the camera and its operator are lowered perhaps 50 feet below the surface. Brilliant lights illumine the water in front of the camera and attract the fish

When the eyepiece of a high-powered microscope is substituted for the usual camera lens, pictures of microscopic subjects, such as the fight between the white corpuscles of the blood and disease germs of various kinds, are possible. On the screen an object is easily magnified thousands of diameters, so that a flea can be made to appear as big as a house. These micro-films of the world of small things greatly aid the doctor and the man of science. The movie camera is also used with the X-ray to produce pictures of digestion and to show the action of heart and pulse and other organs. One high-speed camera takes from 3,200 to 10,000 pictures a second, but when they are shown the speed is reduced 200 times or more—slowly enough so that science can study many things that move much too fast for the eye.

Thus motion pictures are being used in a hundred ways to instruct as well as to entertain. In the schools

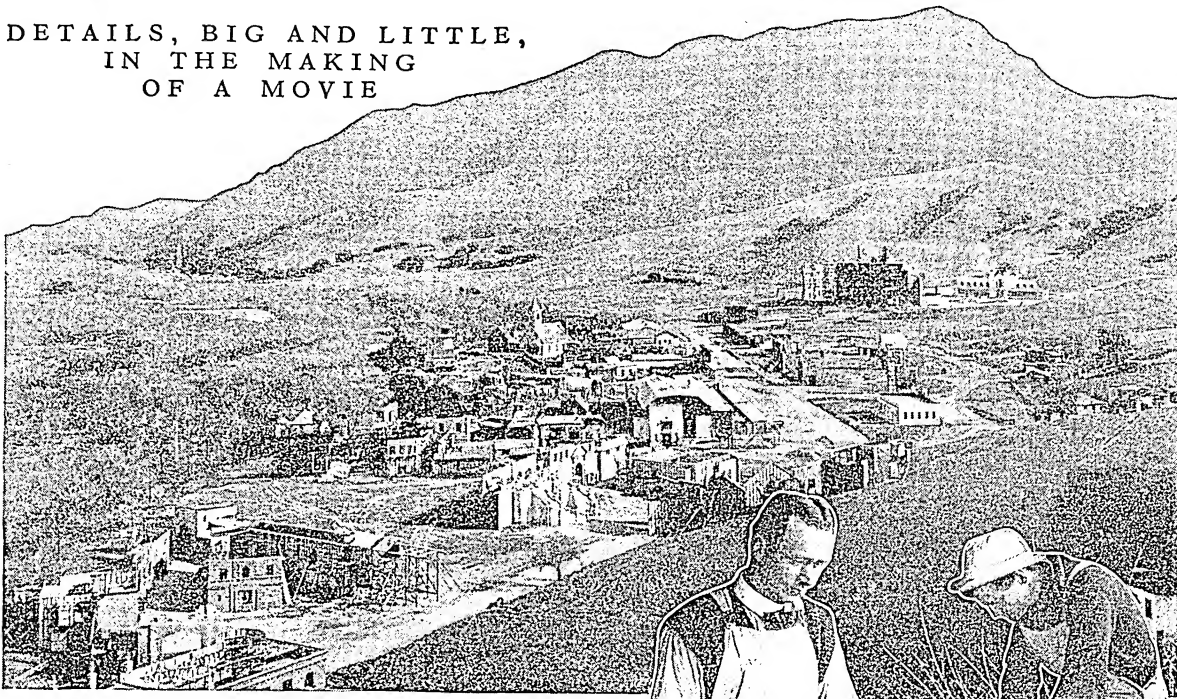


## WHAT YOU SEE—AND DO NOT SEE—IN A MOVIE



As shown here, a "talkie" in the making looks far different from the finished product. In the upper picture is a factory-like scene, with directors and sound and light technicians grouping a large company of actors for a night-club scene. The box-like contrivances, circled in white, which dangle from the ceiling, are microphones to catch the sound. Note the great batteries of lights needed. But everything is arranged so that only a typical night-club gathering appears on the film. Below is a magnificent scene representing Cleopatra's ancient palace on the Nile, as the spectators see it, with none of the apparatus used showing in the picture.

## DETAILS, BIG AND LITTLE, IN THE MAKING OF A MOVIE



The task of making moving pictures calls for a tremendous variety of detail. The very same picture may require the selection of an appropriate mountain for a background, the building of an entire town, such as you see here, and the working out accurately of the tiniest designs for "close-up" decorations, as these men are doing at the right. Every item, little and big, has to be carefully planned to make a truly successful film.



they are being used more and more to supplement the ordinary work of the classroom. Geography is being made into a series of travelogs, and history into screen dramas. Future generations will be able to turn back the cycle of time and see past events unrolled before their eyes, for large producers carefully preserve in storage vaults copies of important films showing scenes of historical interest. Students in a trade school or employees in an industry can more quickly learn their trade by watching a picture of experts performing the various tasks. Pictures taken while the trained fingers of a noted surgeon perform a delicate operation, or while the artist molds the clay or chisels the marble, are used to instruct in the arts and sciences. Great industries make use of the movies to show their product in use, or to show interesting processes and the good workmanship going into its manufacture. Government agencies arouse public interest in patriotic enterprises, health campaigns, improved farming methods, and similar matters through screen propaganda.

But while a limitless variety of subjects are filmed from real life, the make-believe of the drama, both serious and comic, occupies a much larger portion of the film industry. Great changes have taken place in the screen drama. In the early years of the business a comparatively small sum was spent on one production, and 300 feet of film was considered a big

film. Now hundreds of thousands of dollars are expended on a large feature film, which may reach a length of 10,000 feet; and the long serial film may run 30,000 to 50,000 feet. The actors in the early films were "pick-ups," and when an actor from the regular theaters did appear on the film it meant that he was out of work and very much in need of money. They received about five dollars a day with a dollar extra for falling down stairs or taking some other special risk. Today some of the greatest actors in the world appear in the movies, and the highest salaries received by actors are paid in the movies, some of them running into hundreds of thousands of dollars a year.

The world's center of motion picture production is in southern California. There continuous sunshine and clear atmosphere make ideal conditions for perfect filming; and within a convenient distance lie ocean, mountains, untouched forests, desert, and jungles of tropical swamp lands, providing natural settings for all sorts of plots (see Los Angeles). Picturesque characters, such as American Indians, Mexicans, and the orientals of the seaport towns, are easily available. Some of the large moving picture



## BRINGING SCOTLAND TO AMERICA



Of course they don't actually bring any portion of Scotland over, but the effect is just the same. In these pictures the workmen are preparing the setting for a story laid in a Scottish village. After a field had been found resembling the Scotch countryside, carpenters set to work duplicating the village, as you see in the upper picture. After the carpenters come masons and gardeners to build walls and lay out lawns and flower beds. Then the "property men" scatter around their "props"—as those wheels, broken fences, and all the incidentals of the scene are called. The result is a village street in which the native Scotchman would feel quite at home.



colonies are almost cities in themselves, with immense grounds, studios, workshops, carpenter shops, and scene-painting studios, and with thousands of actors, carpenters, mechanics, and engineers regularly employed. In one of these big movie cities 30 to 40 companies may be working at one time. A street in Venice may lie next to Chinatown, scenes from Paris, or the huts of the natives of the tropics; for when scenes of foreign lands are required in a photoplay, the workmen of the studio construct entire streets which appear in the picture so true to reality that even a veteran globe-trotter will seldom detect a serious error in the setting.

Later Long Island and other points around New York City attracted producers, chiefly because stage celebrities are close at hand, and sound pictures brought hundreds of actors and actresses of the so-called "legitimate stage" to the movies, just as they ended the careers of some of the old favorites of the silent screen.

#### How Pictures Are Taken

The standard professional moving picture camera contains a reel of either 400 or 1,000 feet of ribbon film,  $1\frac{3}{8}$  inches wide. The 1,000-foot length is the standard for sound pictures. This film takes a picture just an inch wide and three-quarters of an inch high in silent films; thus the film moves three-quarters of an inch for each picture. For sound pictures recorded on film, the sound strip, one-tenth of an inch wide, reduces the size of the picture. Along both margins of the film are holes exact distances apart, and as the camera crank is turned (usually two or more turns a second), "film-fingers" reach up, engage these holes, and lead the film the proper distance after each exposure. The shutter is closed after each picture for just the brief instant required to move the film into position for the next exposure. In silent pictures the film normally moves and the shutter blinks open and shut 16 times

a second. Sound pictures are taken at 24 pictures a second. For silent pictures a hand-turned crank is generally used, but in sound pictures electricity controls the speed, so that pictures and dialogue may be absolutely synchronized, that is, timed together.

#### Take Sound on Disk or on Film

Talking, or sound, pictures are usually made by one of two methods. In one the sound is recorded on a phonograph disk, which is timed to turn exactly with the movement of the film, both in making the

picture and in showing it. In the other, the sound is recorded on film by an electric device which translates sound into variations in the strength or the width of a beam of light, and this variable beam strikes the film, registering an ever-changing image. The sound is recorded simultaneously with the taking of the picture, although the sound apparatus is in a separate room or booth, to which telephone wires bring the dialogue, music, and other sounds. Projection of the sound in the theater is described later.

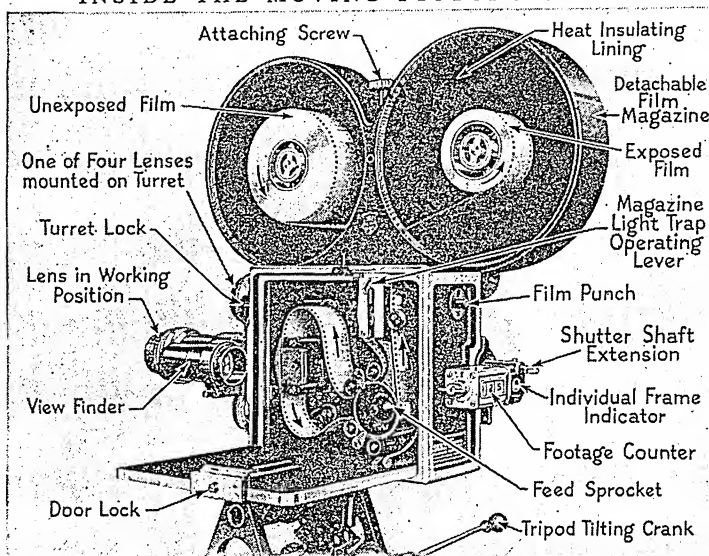
The action and sound are combined on one film when the film is printed. Recording sound on film is cheaper and less

cumbersome than the disk method. However, even when the sound is recorded on film, a disk record also is made for try-out purposes, to make certain that everything has gone right. In taking sound pictures several cameras are operating at the same time; one or more of them records the incidental action while others picture the main action. Often the same action is photographed by two or more cameras, and in the editing the best film is selected.

#### Moving Pictures in Color

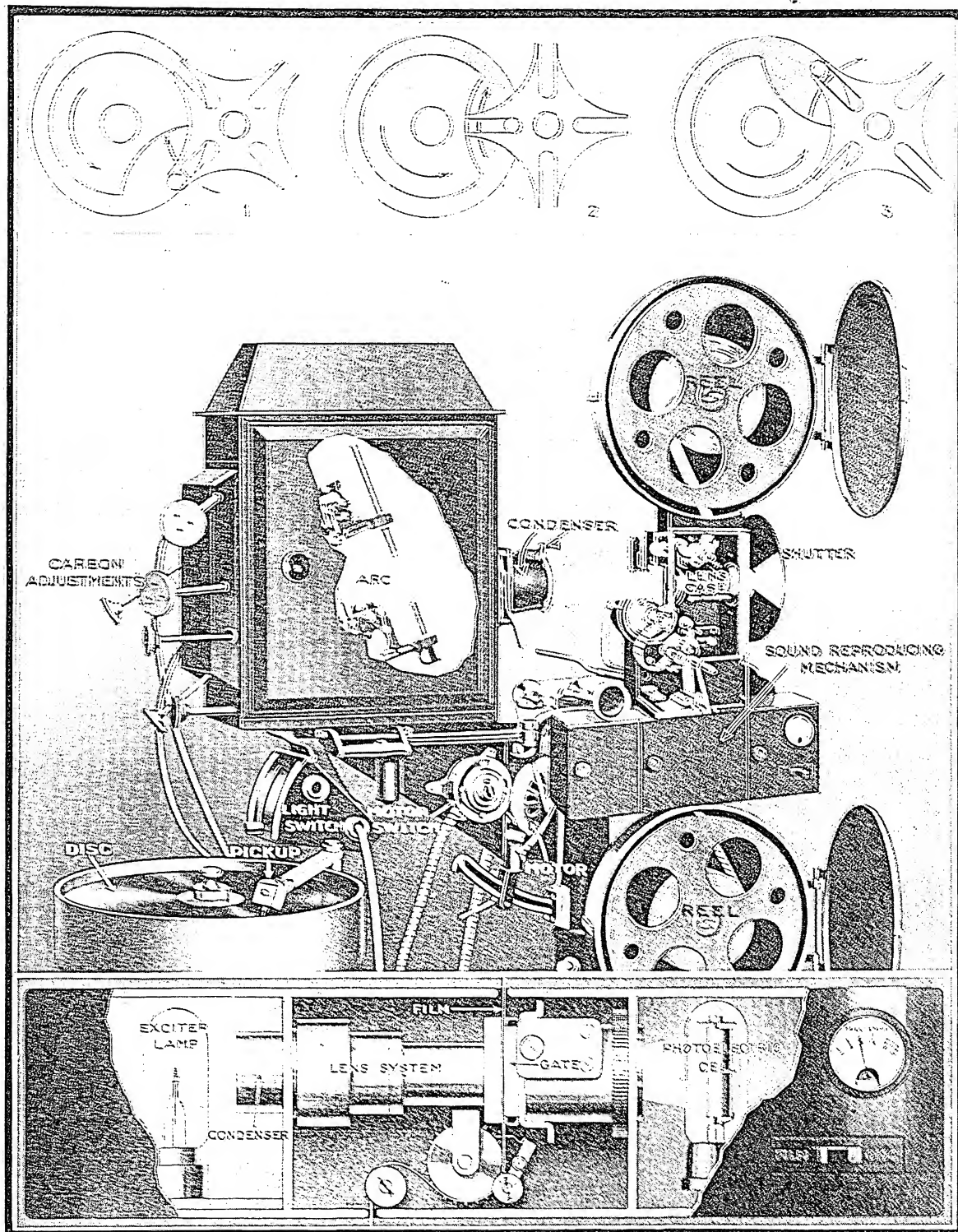
Films in color are made chiefly by the Technicolor process. This was developed first as a two-color and later as a three-color system. Inside a special camera is an arrangement of mirror and color filters which

INSIDE THE MOVING PICTURE CAMERA



The workings of the motion picture camera are not so complicated as you might think. Here you see it with the covers removed from the film magazine and with the camera door opened to show the path of the film through the mechanism. Unexposed film unreefs from the spool in the left, or front, compartment of the magazine on top, passes down into the camera over the top of the feed sprocket, and then to the very heart of the entire motion picture process—the "intermittent movement." The "stop and go" action of the film is accomplished by an exceedingly accurate shuttle which seizes the film, draws it down one "frame" of three-fourths of an inch, and clamps it flat in a little vise as the shutter opens for a fraction of a second to make the exposure. When the picture is taken, the shuttle unlocks the film and draws down another frame, repeating this process 24 times a second for an ordinary talking film. The exposed film passes around the under side of the sprocket and up to the rear compartment of the magazine. Slow-motion pictures require high-speed shuttles that will handle over 200 exposures per second. When shown at normal speed, the apparent rate of motion is greatly reduced. Cameras may be hand-cranked, but for talking picture work they must be driven by small electric motors, which keep the cameras in exact step with the sound-recording mechanism. As many as four lenses of different focal length are carried, mounted on a turret which may be turned instantly to bring any lens into working position. Automatic light traps keep the film from fogging when the magazine door is open.

# PICTURE AND SOUND FROM ONE PROJECTOR



In the center is one type of modern motion-picture projector, equipped to produce pictures on the screen, and at the same time reproduce sound, either by the disk system or from a "sound track" on the film itself. As the film passes from the upper reel to the lower, light from the carbon arc passes through it, then the lens and shutter, to make the picture. The intermittent motion required for film and shutter, described in the text, is produced by the Geneva escapement shown at the top of the page, where a stud on a revolving wheel engages a slot in the "star," as at 1,

turns it at a speed increasing to maximum, as at 2, then leaves it in position as at 3, for a repetition of the movement. The apparatus for reproducing sound from records resembles a phonograph and is shown below the lamp housing in the center picture. The "sound track" reproducer is shown in detail at the bottom of the page. Light from the exciter lamp passes through the track on the descending film, shown at the center, where variations are impressed upon it which fall upon the photoelectric cell. The text explains how this cell then gives the sound effects.

divides the light coming through the lens in such a way that simultaneous negative records are made on three separate films of the primary colors—red, blue, and yellow—that compose the picture's color scheme. Positive "matrices" are printed from the three rolls of negatives, and each is dyed its appropriate color. The matrices are able to transfer their dyes, somewhat like rubber stamps, to the film which will be used for actual projection. One image is printed exactly over the other, and the combination, when projected on the screen, gives a fairly faithful record of the true colors the movie camera "saw" when the picture was filmed.

Kodacolor, developed for amateur moving picture cameras, uses a specially embossed film to separate the colors. Only a single positive is made; no prints are possible. Stereoscopic movie cameras make two films of the same subject from slightly different angles. One is dyed red and the other green, and the two are projected on the same screen, but slightly off register. To the naked eye the effect is a jumble, but when viewed with a red film over one eye and a green film over the other, there is a startling appearance of depth in the picture (*see Stereoscope*).

#### Developing, Editing, and Printing

The exposed film of moving pictures is developed in exactly the same way as ordinary camera films (*see Photography*), except that it is wound on a wooden frame for convenience in handling, and remains on this frame as it is dipped in one tank after another in the process of developing. It may then be wound on a large rotating cylindrical frame for drying, done with fans in a dustproof room; or drying machines may be used. This original film is called the "negative," and from it any number of "positives" may be printed.

The negative must be inspected, edited, and the whole picture assembled before the final release prints are made. Preliminary prints called "rushes," may be made, however, for editing, as a result of which certain scenes may be taken over and other changes made and transferred to the original negative. The scenes of a picture are not photographed in their proper order, so the negative appears as a hodgepodge of scenes; then, too, more film is usually exposed than will appear in the completed picture, and other changes may be found necessary in the editing. So the negatives go through a process of cutting, and are reassembled by splicing the ends with special cements.

Originally celluloid films, which are highly inflammable, were used, but to reduce the danger of fire they were replaced by a nitrate film for professional use and by an acetate film for the amateur's camera (*see Cellulose*). The printing is done on practically the same kind of transparent sensitized film that is used for the negative. Machines carry the two films, one laid smoothly over the other, and hold them together while the light from a small electric bulb falls on one tiny picture after another until the long roll is printed. Films bearing sound records are printed twice; the pictures are printed first, then the

sound strip is printed along the side of the same film because it is originally recorded separately.

The positives may be developed by hand, but today it is more usual to develop them on an automatic machine which carries them through the processes of developing, fixing, rinsing, and washing, after which they pass through a drying cabinet and come out ready for distribution.

Films go from the producer to film exchanges in the large cities, which rent them to the theaters. They are returned to the distributors for repairs, and after the theaters are through with them they go back to the producer, where those worth keeping are stored.

#### Showing the Picture

In the motion picture theater the projectors are operated from special fireproof rooms, or "booths," with ports through which beams of light are thrown. Each theater has two or more projectors, so that at the end of a reel a new reel may be started on another machine and the picture continued without interruption. These projecting machines operate much like the old magic lantern (*see Stereopticon*). A device similar to that used in the camera moves the film while a shutter is closed for an instant after each picture. The shutter has two blades, one of which shuts off the light during the movement of the film. High-intensity arc lights are used in the projection.

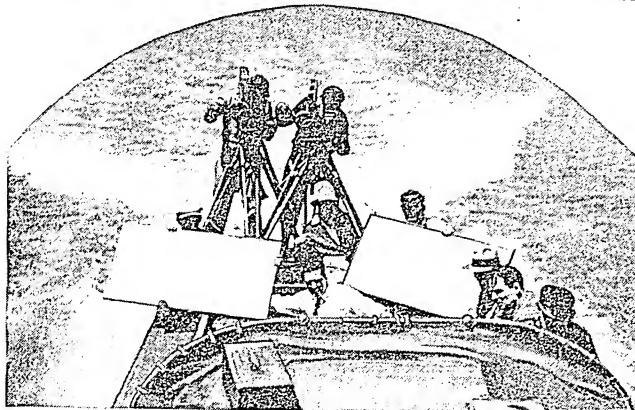
For showing sound pictures with the sound on the film, there is attached to the projector a sound-reproducing unit, in which a strong beam of light shines through the sound track of the film and into a photoelectric cell. The sound track varies the intensity of the light beam in direct step with the sound waves as photographed on the film, and the photoelectric cell translates these variations into electrical impulses (*see Photoelectric Devices*). These impulses are amplified in the usual way (*see Radio*) and led by wires to loud speakers behind the screen. The sound head on projecting machines is 19 frames ahead of the picture opening, so the sound track on a film is 19 frames—about  $14\frac{1}{2}$  inches—in front of the picture frame with which it is synchronized. When the sound has been recorded on a phonograph disk, an electric "pick-up" device instead of the photoelectric cell furnishes the electric impulses. In most theaters the projectors are equipped to show sound pictures made either on disks or on film.

#### It's All an Optical Illusion

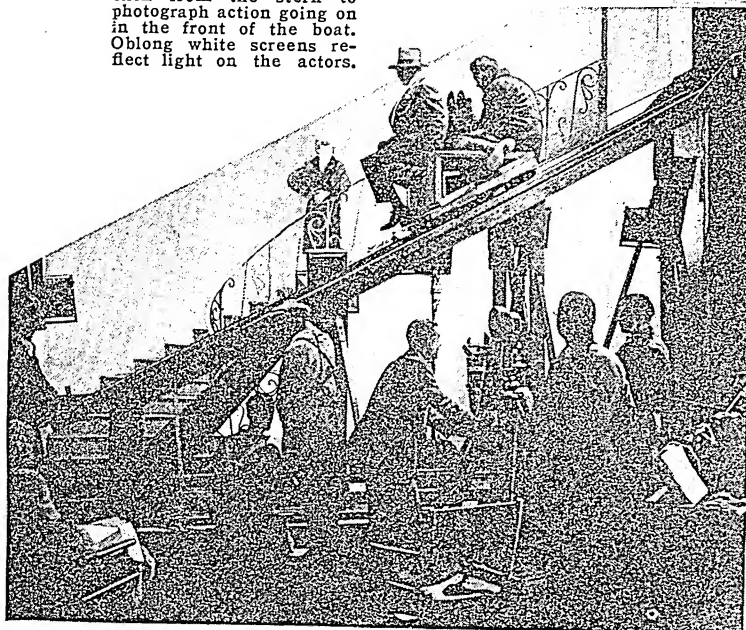
From the foregoing description it is clear that what you see on the screen is not really a series of pictures in motion but a series of still pictures flashed one after the other. The illusion by which you see the series of pictures as a continuously moving scene is due to the property of the eye known as "persistence of vision." The impression received by the retina of the eye lingers for a fraction of a second after the stimulus has ceased, so that in the brief interval (from  $\frac{1}{16}$  to  $\frac{1}{8}$  of a second) between pictures while the screen is blank, the eye retains an impression of one picture until the next one is on the screen.



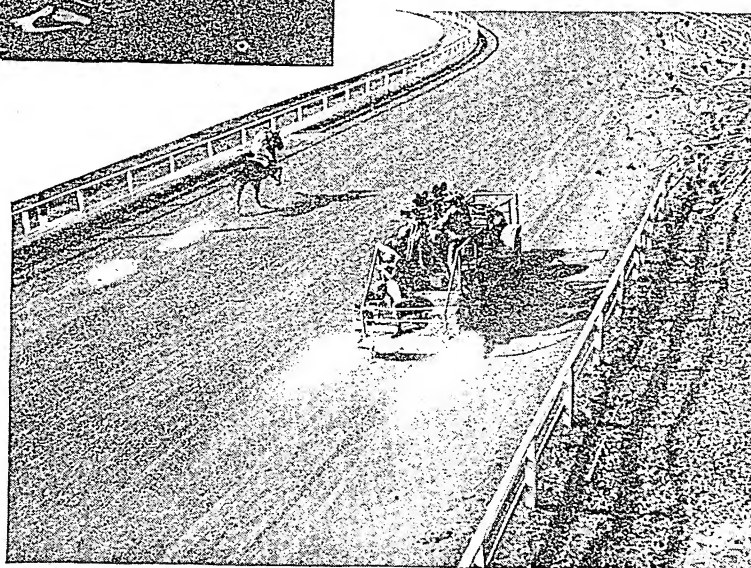
## CAMERAS GRIND FROM MANY STRANGE PERCHES



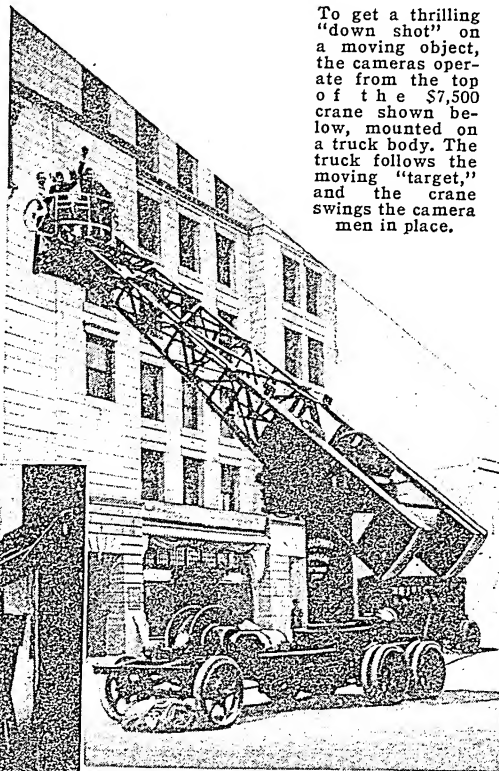
Zippering over the waves in a speed boat, the cameras click from the stern to photograph action going on in the front of the boat. Oblong white screens reflect light on the actors.



The excited heroine raced up and down stairs in a part of the action of the motion picture being filmed above. So a small car was arranged to run on a track beside the stairway, and the camera man thus sped up and down following the distraught lady. In the lower right corner of the picture we see the heads of musicians who are supplying music to induce the right mood in the players.



To get a thrilling "down shot" on a moving object, the cameras operate from the top of the \$7,500 crane shown below, mounted on a truck body. The truck follows the moving "target," and the crane swings the camera men in place.



How can you get a movie that follows a racehorse galloping around the track? Below we see cameras mounted on a fast motor car, with a railing to keep the camera men from spilling out upon the tanbark. It takes a steady hand to turn a camera crank evenly in a car moving at high speed.

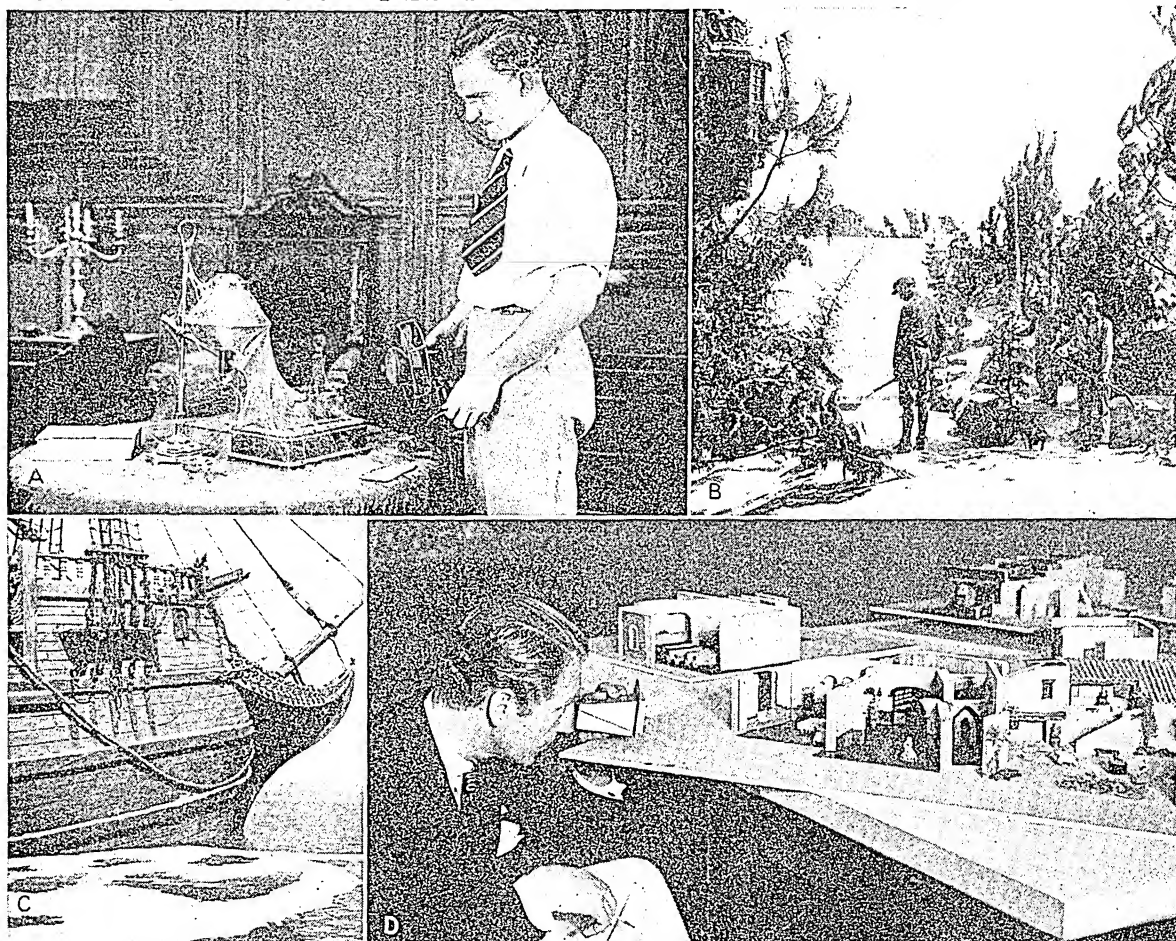
In this way the pictures blend into one another so that we have the illusion of seeing one continuous picture.

#### Some Tricks Played by the Camera

Trick photography is among the greatest assets of the movies. For such work every large studio has its own special processes, which are guarded jealously as trade secrets. You see a powerful automobile

desired, such as a castle, a fortress, or a city street, is painted on glass and hung a few feet before the camera, so that the upper scope of the lens will fuse it with the set. Buildings to be used with "glass" are put up only one or two stories, wherever the action is to occur; the rest of the building is painted on the glass, carefully designed so the lines will coincide.

#### SOME "TRICKS OF THE TRADE" IN MAKING MOTION PICTURES



To equip a haunted house with cobwebs, a technician simply sprays objects A with a chemical mixture which hardens into delicate filaments, shaped as desired by manipulating the air blast. At B workmen are spreading "snow" made of marble dust and magnesite. In C melted paraffin, cooled on water, has "ice bound" an old-time ship. In D a scenic designer is using "doll-house" models to plan the interior and exterior of a luxurious home.

racing a motorcycle policeman at terrific speed. That scene was made with tiny model cars, and a moving back drop gave the effect of speed. An actor takes dare-devil chances high up on one of a number of great skyscrapers. The buildings were really small models, which, photographed at close range, look as large as the originals. The actor performed in complete safety in his studio; his figure, superimposed on the other film, produces the thrilling effect you see on the screen. Trick photographing of a tiny model ship tossing in a tank produces the illusion of a great liner pitching in a hurricane.

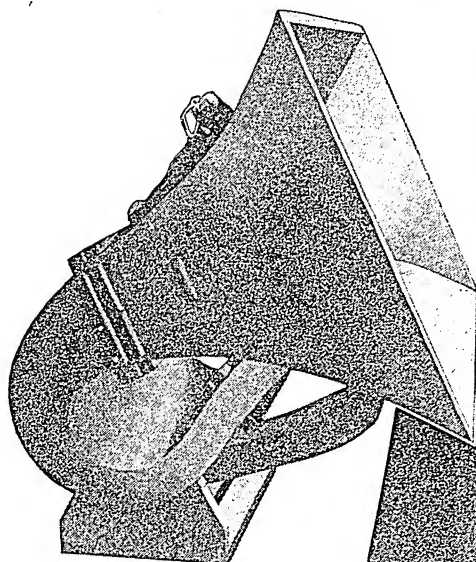
The "glass shot" is a favorite device that saves much time and money. A background of any sort

Actual motion pictures, projected on translucent screens, are also used to supply a realistic background. One such scene showed the interior of a yacht club through the window of which a sailboat race could be seen. The "window" was a frosted glass screen on which a projector was casting the racing boats while the camera, synchronized with the projector, took the pictures of two girls inside the club and the boat-race scene.

These are only a few of the tricks of movieland. Airplane motors and propellers make blizzards of shredded asbestos or corn flakes, and a blanket of sparkling snow may be only gypsum. A film duplicator for the amateur's camera produces two images of the

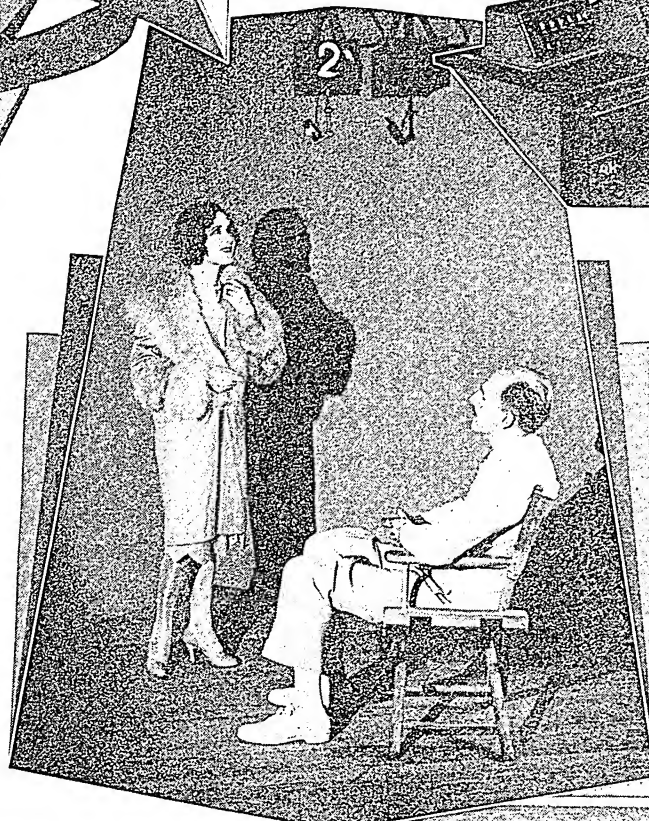
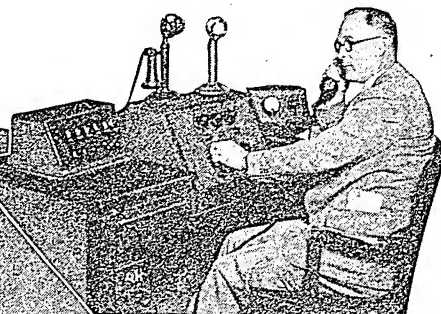


# MAKING SOUND FILMS IS A COMPLICATED PROCESS



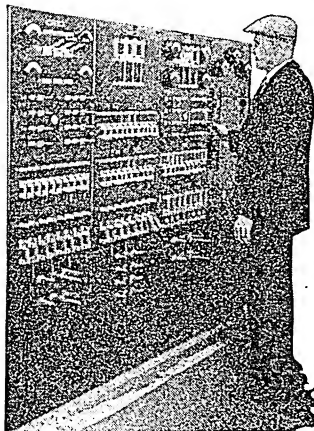
**THE LOUD SPEAKER**, which makes the new talking motion pictures practicable, is the big brother of the new-style phonograph horn, with its subtle curves and folds (see Phonograph). The curves were not designed just to save space, however. The folded horn tapers from its wide mouth to a small entrance opening, this tapering being measured according to a logarithmic scale. The tapering, and the sudden shifts of direction caused by bends or folds, catch the tones traveling from the small end of the horn to the large end, and return them to the diaphragm at the small end, thus increasing the diaphragm motion and adding to the resonance. The bends also serve to divide the horn into segments, each with its own natural period of vibration. The dimensions of the segments are carefully calculated, so as to increase the number of tones to which the horn is resonant.

**THE MONITOR**, or the "mixer," is the "master organist" of the speaking film. He sits in a sound-proof room, watching the action on the stage through three thicknesses of glass. A loud speaker connected with the stage reports to him all the sounds which go to the recording device. Before him is a board with several dials, each of which controls for each microphone the sound which is to be carried to the recorder. With the dial he can increase or decrease the volume of this sound; he can reduce the volume of the orchestra, or play up the boom of the villain's basso. If he hears some sound which should not be present, or which comes through the microphone in a startlingly unnatural manner, he expresses his horror by flashing a signal light to stop the action, and by telephoning to the director that the rustle of the heroine's silk dress sounds like a hail storm. The scenes are first recorded on a wax disk and played back to the director and actors, to see what effect has been obtained. Then they are retaken, with the sound recorded either on the film itself or on a disk record. But in any case, the monitor always listens.

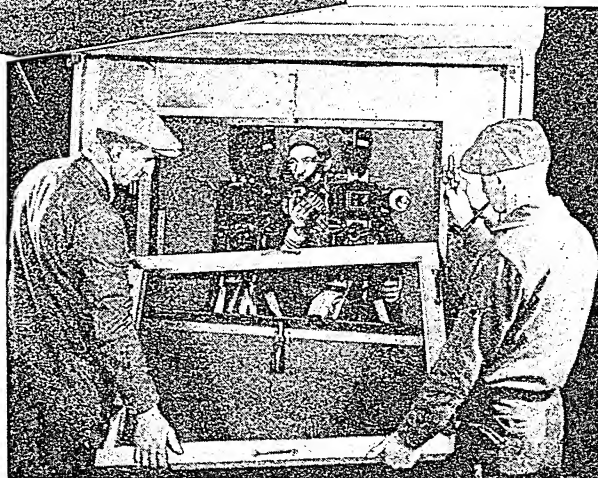


**THE MICROPHONE** is the tyrant of the actors in the new talking moving pictures. Like the actress rehearsing at the left, they must always keep this little instrument in mind, remember to talk in a low, conversational tone, and not walk too far off from the tyrannical "mike."

**CAMERA MEN** may be caged in movable cabinets like the one below, with a plate-glass door and rubber-tired wheels. To breathe, the photographer wears a gas mask with a supply of oxygen. He talks to persons outside by a telephone. When he must go nearer the scene, his cage is wheeled silently up. No sound of wheels or clicking camera must be recorded on the film. Silenced cameras are operated with a deadening hood over the camera.



**AMPLIFIERS** must increase the sounds which come from the microphone, and synchronizers must keep the recording apparatus in exact time with the camera. In two methods the sounds are literally photographed on the film by the use of a photoelectric cell. In a third method, large phonographic disks are made, and motors, synchronized with those which operate the picture projector, play the records in perfect time with the picture. Try-out disks are always made, whatever the final method. The man at the left is operating the control panel which regulates all the complicated sound recording apparatus.





## HOW ANIMATED CARTOONS ARE MADE TO "MOVE"



The difficulty of making a "cartoon film" may be judged from the fact that from 8,000 to 10,000 or more "frames"—that is, separate pictures—are required on the film, and each one not only must be separately drawn, but the stationary parts must be in exactly the same position from picture to picture. To reduce the labor of doing this, the stationary and moving parts are prepared separately, as shown. To show a mouse playing a piano, the artist at the upper left has one drawing under his hand, of the general scene, and other drawings showing successive movements of the mouse. All are on transparent sheets of celluloid. He places one after another of the "moving" pictures over the background scene in a printing frame as in B, and photographs each composite with an overhead camera, shown in D. If a moving background is needed, it is first prepared (C), then moved slightly for each successive picture, as the last view shows. The resulting photographs are printed one after another to make the film.

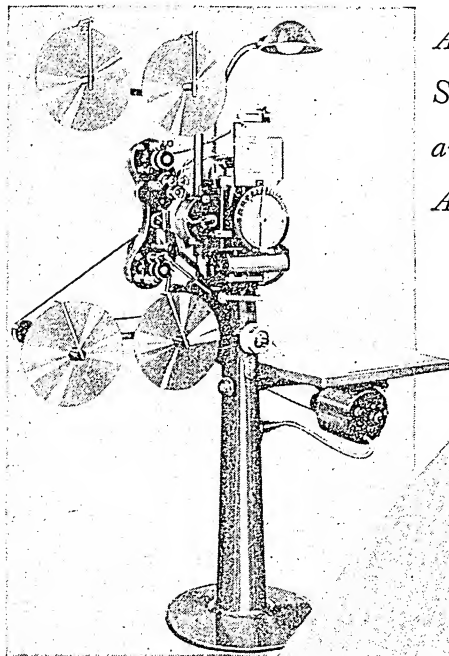
same object in various relative positions and thus opens up a wide field of comedy.

Animated cartoons are among the most universally popular type of motion pictures. They are made by photographing a series of drawings. About 8,000 drawings are needed for 500 feet of film. Large staffs of "animators" are maintained by organizations which produce and distribute this type of film exclusively. For making sound cartoons the artist has music and guide sheets before him, and he makes

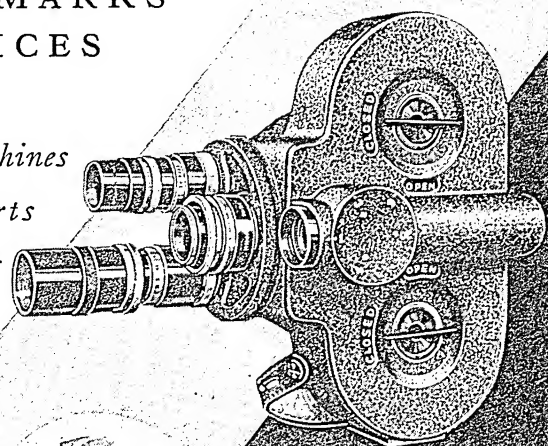
an exact number of drawings from one beat of the music to the next, in order to time the music with the action. He works over a light, and using tracing paper, makes each new drawing over the previous one, so that he can see just what change is needed to carry along the action. Formerly the whole picture had to be drawn over for each change in the action, but now, through the use of transparent celluloid, one background drawing is sufficient, and sometimes only parts of each moving figure have to be drawn for each change.

# DELICATE PRECISION MARKS MOTION PICTURE DEVICES

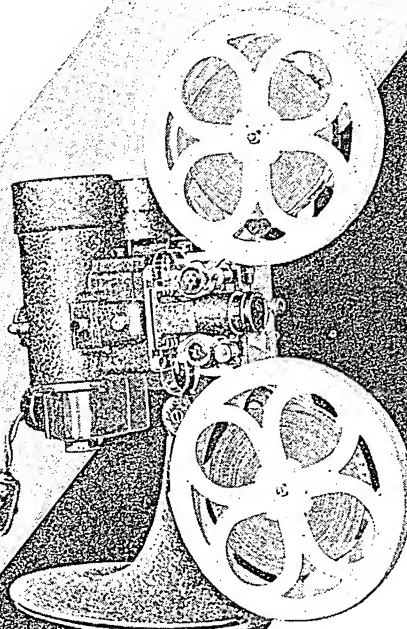
*Amazing Machines  
Serve Experts  
and Amateurs  
Alike*



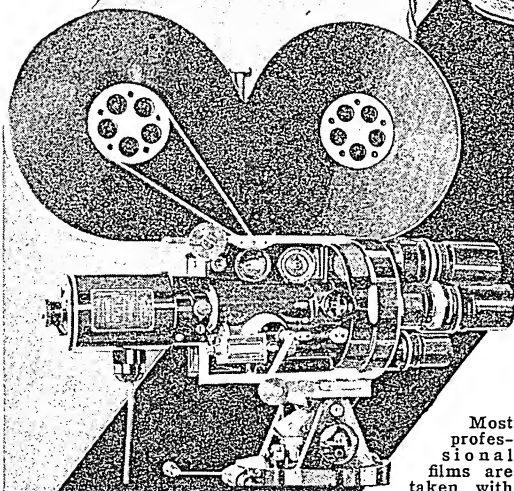
The printing machine (above) prints positives from negatives, with never the least slipping of the two films.



Three lenses of different focal length, with an exact viewfinder, give the amateur camera (above) a professionally wide range.

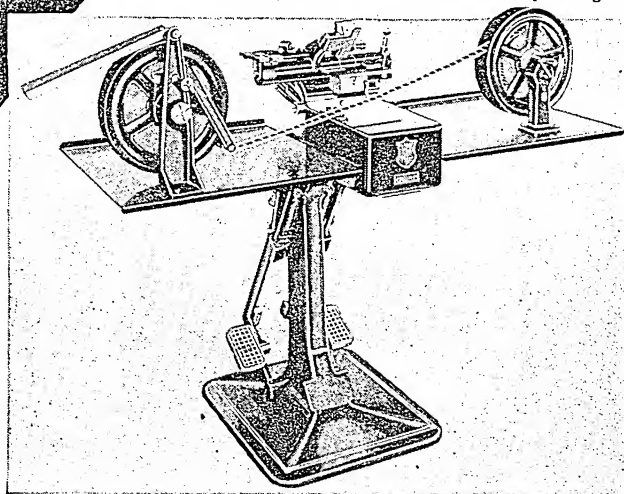


"Movies" now entertain in many homes, thanks to the excellent amateur projecting machine at left. It projects the 16-millimeter film (slightly over half an inch wide), enlarging it to life size.



Most professional films are taken with cameras similar to the American Bell and Howell machine at the left. It has an electric motor and a hand crank in case the motor goes wrong. Amateur cameras are automatic.

The film-splicer, below, cuts film in two, and keeps it from curling while unwanted parts are removed and the film is respliced, or strips bearing captions are added with special glue.

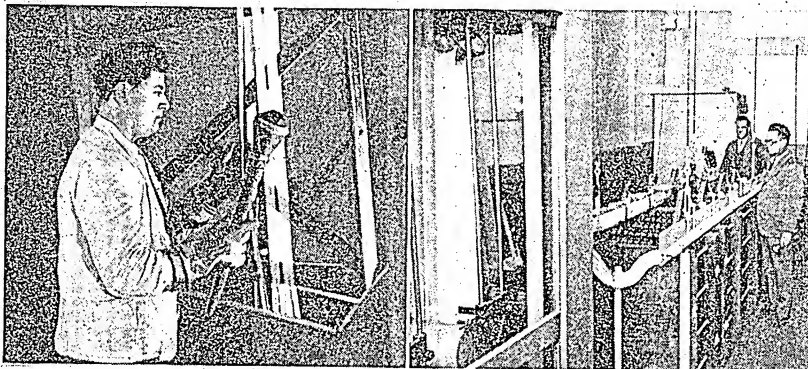




## THE BIRTH AND GROWTH OF A MOTION PICTURE FILM

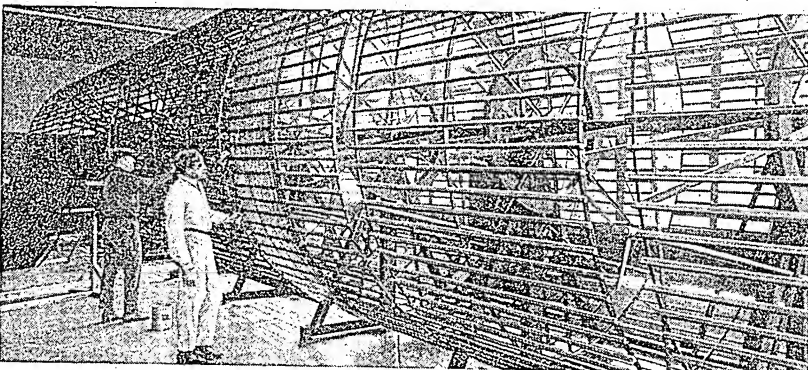


Even for "talking" pictures, the film is made much as for silent films. The handy "talkie" camera outfit at the left is valuable for outdoor work, such as newsreel pictures. The sound is captured and transferred to the film by the bell-like device with the little microphone at its top, seen at the left on the tripod. The camera itself (at the right of the tripod) resembles that explained on a previous page. The monitor, or "mixer" of the sound, in studio "shots," sits in a sound-proof, glass-inclosed room like that shown in the second picture, from which he can see and hear everything.



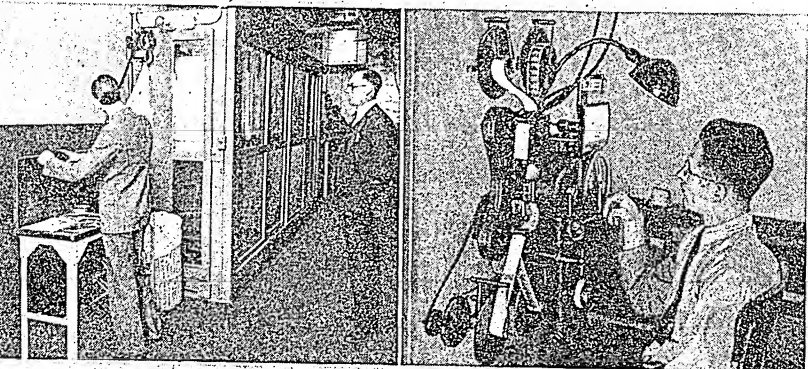
## DEVELOPING THE NEGATIVE

The developer in the left-hand picture uses a red light to inspect a film during development because red light does not injure the film. The most efficient and complete developing machine known is shown in the right-hand picture. Starting on the spool at the right, the negative passes through four compartments of the tank, containing water, developer, "fixer," and again water; next it passes to the drying cylinder at the left, and finally out of the cabinet, as will be shown later.



## ANOTHER DRYING FRAME

This is the way film is often dried when the machine is not used. After the film has passed through the necessary chemicals, it is wound on huge frames like this one and left to dry. The man in white is inspecting a section of film. The greatest care is used throughout to avoid blemishing or scratching a film, for a mark on the film that is scarcely larger than a postage stamp will loom up as an unsightly blur when the picture is enlarged many times on the screen.



## MAKING THE POSITIVE

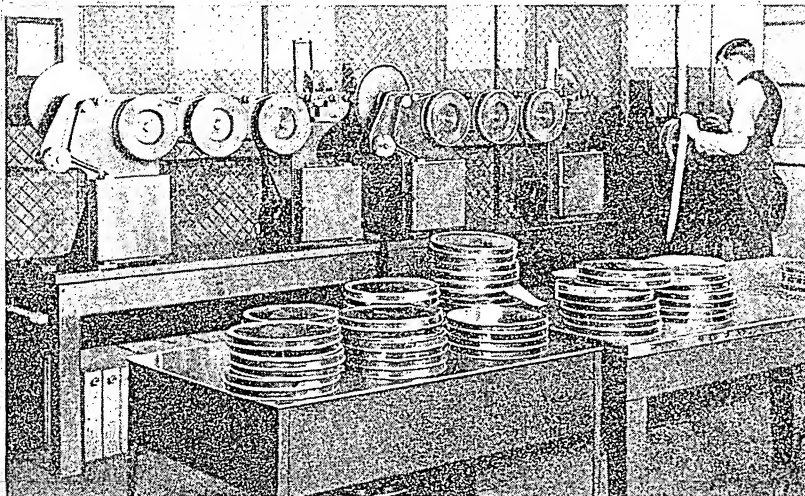
In the left-hand picture you see the completed negative as it is automatically wound on spools at the end of the developing machine shown in the fourth picture on this page. The man at the right is making a positive from a completed negative. He runs the negative through his machine with a blank film. At a certain point light strikes through the negative and produces a positive on the blank film. The films are held together by air pressure while this is being done.





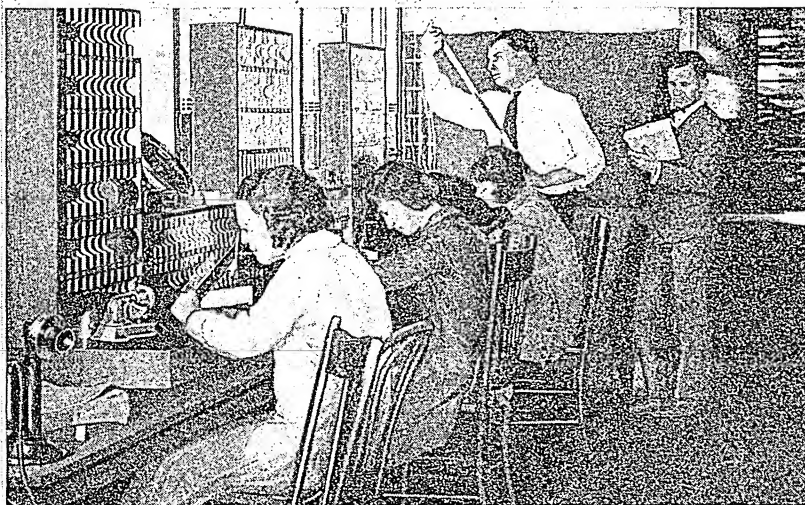
#### TRIMMING THE FILM

In addition to the editing, the film itself requires a lot of attention. Here, for instance, is the department where surplus material is trimmed away. In many cases films require tinting, in order that they may show blue for moonlight, red for fire, and so on, when projected on the screen. When you stop to think that there are 16,000 photographs for each thousand feet of film, and that a long serial may run to 50,000 feet, you can appreciate the enormous task involved in the detailed inspection and preparation of the reels. All the fine points are worked out bit by bit, and the exact places for switching from one scene to another are carefully selected. Often the amount of film "killed" exceeds the amount used.



#### CLEANING THE FILM

Here is a battery of machines engaged in cleaning and polishing films. In spite of all the care and precautions used, a film accumulates dust and dirt during the many handlings it must undergo, and all this must be removed as rapidly as it accumulates. The principle of this machine is simple. On the bench against the wire screen are two sets of spools, each driven by an electric motor. The film rises from one box, passes over the various spools and buffers, and is wound up in the other box. At this point it may be well to explain the process called "rewinding." Whenever, during the handling of a film, it is run off from one spool to another, the relative position of the pictures on the film is, of course, reversed. Then it must be rewound so that the beginning of the series of pictures shall be on the outside of the reel.



#### ASSEMBLING PARTS

As each portion of the film is trimmed and prepared in its final approved form, it is brought to the assembling department. Here skilled women, acting under the direction of final editors, fasten together the various parts in their consecutive order, inserting all titles and sub-titles, according to carefully prepared directions. The joints are made by applying a liquid which dissolves the surface of the celluloid. When two ends so treated are brought together in proper "register" and allowed to dry, they become like a single strip, so firmly are they welded. The film is then rolled on reels ready for the final inspection.



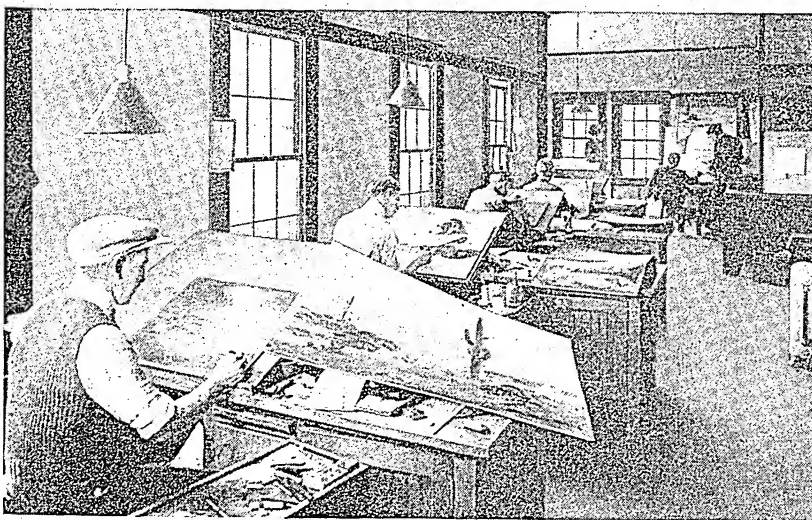
#### ASSEMBLING SOUND AND ACTION

Cutting and assembling sound and picture film is a task for an expert. This technician is matching the sound, on the apparently blank film closer to him, with the pictures on the other strip. The sound runs 19 frames ahead of the accompanying picture frame because the sound head on projectors is so arranged. After this man has matched sound and pictures properly, they are combined on one film, which of course is a positive; from that positive still another print is made, and this print is the master negative from which as many positives as desired are made for rental to theaters throughout the country.



#### NOW THE FIRST TRYOUT

At last—perhaps months have passed since the first click of the camera—the picture is ready for its first test showing. Here a sound engineer and a head cutter are listening to the sound on a film while they watch the progress of the picture itself through a tiny "movie" machine. Those head-phones bring them the sound just as it is heard from a theater screen. If these experts are satisfied with this test, the film is ready for its first "trial" showing in one of the pre-view theaters of Hollywood or perhaps Long Island.



#### IN THE ART ROOM

The "talkies" have all but eliminated the clever subtitles which helped tell the progress of the plot in silent films, but there still is a great deal of art work to be done. The decorative titles of pictures, the names of the cast, and the occasional sub-title are done by staffs of artists such as these. When finished, the "copy" is set up and photographed on a stretch of film which is combined with the film carrying the sound and pictures. The preparation of short sketches from actual pictures, to be shown on the screen as advertisements for coming attractions, requires a great deal of this art work.

There is scarcely a phase of the great motion picture industry that was not affected to greater or less degree by the coming of the sound picture. A new type of scenario writer was needed, for good dialogue instead of merely a plot required the talent of successful playwrights and novelists, and competition for these writers and for the rights to plays sent up salaries and prices. Many of the favorite stars, with long contracts at high salaries, could not be used in sound pictures because of poor voice or speech, or because they spoke only a foreign language; and new stars had to be found. Meanwhile studios were undergoing revolutionary changes. Sound-proofed stages, recording apparatus, mixer and monitor rooms, and an elaborate system of controls and playbacks were introduced; and an army of sound engineers, composers, electricians, and voice culturists was enlisted. The noise had to be taken out of cameras and out of lights. Theaters suddenly had the problem of acoustics thrust upon them, and they, too, had to install new apparatus for sound reproduction.

#### Effect of Sound Pictures on Film Exports

Business in America was wonderfully stimulated, for a fickle public was tiring of the silent picture, but language difficulties caused a great slump in the foreign markets. In the days of silent pictures the United States supplied from 35 per cent to 95 per cent of all the films used in foreign countries, but after the advent of the talkies this figure dropped to 10 per cent and less. Animated cartoons and newsreels continued popular, but feature pictures had no market abroad. Thus the internationalism of the motion picture was to a great extent destroyed. Producers tried various schemes to remedy this evil, but finally found that to make a film satisfactory to foreign audiences, it had to be remade entirely in their languages. This led to the importation of foreign casts and directors, and to the establishment of studios in European countries for the remaking of American films.

#### The Art of the Movies

A motion picture "set" is the organized setting and equipment that makes up the scene to be photographed. At first sets were built on outdoor stages, for it was considered necessary to use natural light. Later glass stages were built and hung with white and black diffusing cloths that could be pulled as the light changed at different times of the day. Today studios use artificial lighting entirely, and only outdoor scenes are photographed by sunlight. Very powerful lights are needed. White-flame arc lights were in general use until panchromatic film (a variety sensitized by means of dyes) was introduced; then incandescent Mazda lights were employed, often in combination with silent arc lights.

Settings were at first crudely designed. Later, draftsmen were engaged to draw plans, and finally the planning of settings was brought into the realm of art, and the services of architects, painters, dramatists, and research departments were required.

The work of the director, too, has come to be a fine art. Originally he was merely a stage manager, whose chief business was to see that the characters did not hide one another from the camera, and that important action was properly placed. Today the author, the designer, the photographer, the actors, the editor of the film, and many others look to him for direction.

Motion pictures called for an entirely new art of make-up, for few principles of stage make-up could be used. The darker colors photograph black and the paler ones white, so a new color scheme had to be worked out. Pink with bluish tones was found satisfactory, and some stars use a purplish make-up. One advantage that the motion picture actor has is that facial defects may be easily remedied by the use of make-up. Double chins disappear under red, and various colors used about the eyes will change them in various ways. The panchromatic film gives more leeway in the use of colors, and permits the face to be photographed satisfactorily without make-up. Men now use little or no make-up except for character parts, or for some other special purpose.

#### Motion Pictures as a Business

Hand in hand with the technical development of the motion picture went the growth of huge business organizations, using hundreds of millions of dollars in capital. In place of the early day "nickelodeon"—a vacant store equipped for showing pictures—has come the "motion picture palace," with elaborately decorated corridors, lounge rooms, huge lobbies and staircases, as well as a sumptuously decorated auditorium. Elaborate stage productions often supplement the films, and the number of employees may run into hundreds. Scores of millions of dollars have been invested in such houses, and they usually get the "first runs"—that is, initial showings.

With such an investment, and the cost of a single picture running from several hundred thousand to over a million dollars, the possibilities of loss are enormous, unless the picture proves popular. This, coupled with the fact that a large portion of the public is attracted by the people appearing in a picture, rather than by its dramatic merit, has done much to fasten the "star system"—that is, the exploitation of well-known actors—upon the industry.

"Showmanship"—methods designed to excite interest in a new picture—and publicity also have been highly developed. One development in leading centers, such as New York and Hollywood, has been the "first night," attended by newspaper critics, guests of the producing company, and perhaps the actors appearing in the picture. Newspaper and magazine critics, however, usually are given an opportunity to see each film in a "pre-view," or private showing, so their criticisms can be prepared by the time the film is released for public showing.

Another development, and a constant source of argument between public authorities, producers, writers, and actors, has been censorship of pictures

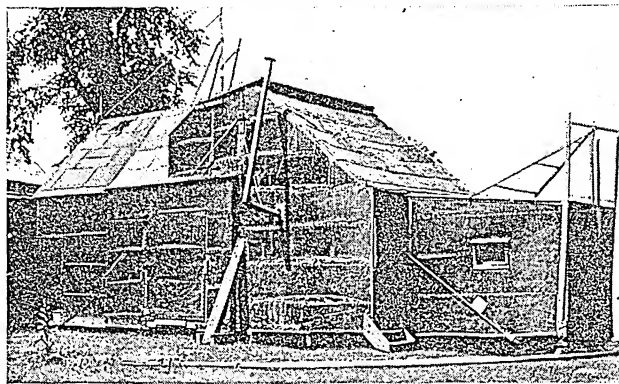


before they can be shown. Sometimes this is done by the state authorities; in other states, the police departments of the cities provide the censors.

#### How Motion Pictures Were Invented

One of the early experiments in motion pictures was the children's toy called the "wheel of life" or

#### "OLD AND NEW" IN MOVIEDOM



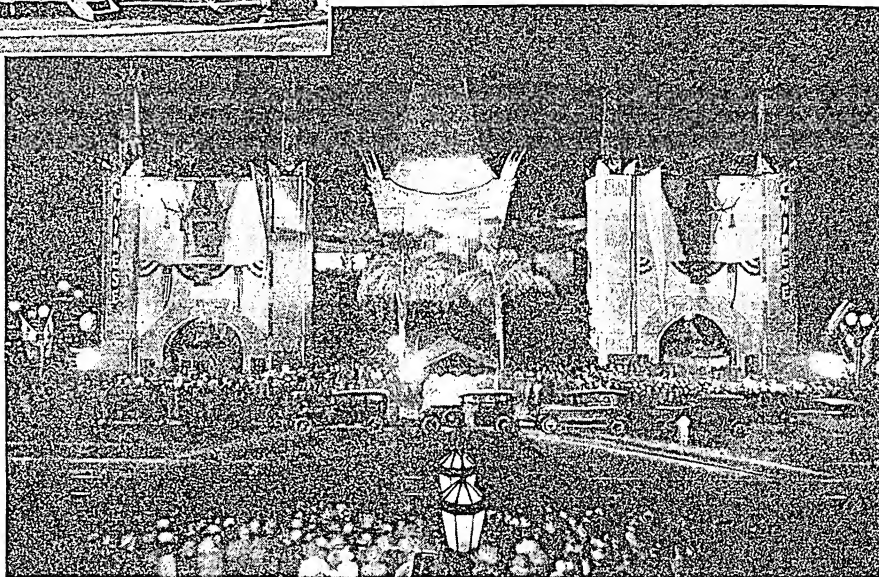
zoötrope, invented in 1860 by a Frenchman, Desvignes. A few pictures in series were placed on the inside of a disk or a hollow cylinder, and an eyepiece was so arranged that only one drawing could be seen at a time while the disk or drum was whirled about. Crude as it was, this toy can really be called the germ of the motion picture. As soon as it was found possible to take snapshots of subjects in motion, photographs instead of drawings were used in the "kinematoscope" and similar devices. Years of experiment and invention followed, before motion pictures reached their present development.

One of the most important of these experiments was made in 1878, when Edward Muybridge, of California, set up 24 cameras a foot apart along a race course and took 24 successive snapshots of a running horse. These pictures attracted a great deal of attention, especially among artists, who were thus enabled to study the positions of moving animals. The pictures were placed in a device like the zoötrope to make a moving picture. In Muybridge's pictures the running horse remained in the middle of the screen and simply pranced up and down. In order to have the motion natural, as seen by one pair of eyes, the pictures must be taken by one camera.

The first camera to take a series of pictures in rapid succession was the "photographic gun" used by

E. J. Marey, the founder of Marey Institute in Paris. The Marey gun-shaped camera took pictures around the edge of a glass disk. Then came the second great step in motion picture history—the invention of the celluloid film to take the place of cumbersome glass plates. The first film was made in 1888 and its first important application was in Edison's "peep-hole" machine, the "kinetoscope," which was first publicly exhibited at the Columbian Exposition (World's Fair) in Chicago in 1893.

The only remaining step was to devise an apparatus that would permit the kinetoscope pictures to be thrown on a screen. Several attempts had been made with varying success. The "cinématographe" of Louis and Auguste Lumière, of Lyons, France, was the most noteworthy until C. Francis Jenkins, of Washington, D. C., collaborating with Thomas Armat, discovered the principle of the modern projector, and produced a



These pictures illustrate the growth of the motion picture industry in about thirty years. The upper picture shows Thomas Edison's first studio in New York City. The first theaters were simply neighborhood stores—a crude beginning that developed into palaces like the Hollywood house in the lower view, where so many pictures receive their first showing before audiences composed of leading people in the industry. In the picture, one of these brilliant "first night" crowds is arriving, while the public stares from the sidewalk, to glimpse favorite stars.

machine which was later called the "vitascope." A picture shown publicly in New York City in 1896 with the so-called Armat machine was the beginning of the commercial career of the motion picture.

Sound pictures are an outgrowth of experiments conducted in the Bell Telephone Laboratories. In 1926 'Don Juan', a film with musical accompaniment, was shown; and the following year a full-length film with music and dialogue, 'The Jazz Singer', marked the beginning of a new era in the motion picture industry. Rapid improvements in the machinery for recording and reproducing sound followed.

A list of the terms most commonly used in the motion picture industry will be found with the entry Motion Pictures in the Fact-Index.

**MOTOR BOATS.** The motor boat like the motor car was made possible by the gas engine. The changes it made in water transportation were almost as great as those caused on land by the automobile.

Steamships still bear the biggest share of water traffic, just as railways still carry the most land freight. The service rendered by motor boats, on the other hand, may be likened to that of trucks, tractors, busses, and passenger cars. These craft, powered by gasoline or Diesel engines, range in size from cargo boats and yachts over a hundred feet long to tiny skiffs and dinghies equipped with midget-size outboard motors (*see Gas Engine; Ships*).

The best-known types of motor boats are the speedy runabouts and luxurious pleasure cruisers that ply the bays and inlets of our seacoasts and inland rivers and lakes during the warm seasons. Almost as well known are the high-powered craft used in motor-boat racing, including those with specially designed hulls of the hydroplane type capable of speeds of over a hundred miles an hour on short runs. More numerous and important than the pleasure craft are the motor boats used by commercial fishermen, from the small open boats that work in quiet waters to the big Diesel-powered ships that venture far out to sea. Many of the latter are "motor sailers" equipped with sails as well as engines.

Motor boats have proved their value in warfare as patrol vessels, airplane rescue or "crash" boats, troop-landing craft, submarine chasers, escort vessels, and the motor torpedo boats (MTB's) and patrol torpedo boats (PT's) of the so-called "mosquito fleet." The last are the fastest of all naval vessels, capable of speeds over 55 knots. They are from 70 to 80 feet long, built of thin plywood, and powered with three supercharged engines each of 1,500 horsepower. They carry heavy machine guns and four torpedo tubes. In both Atlantic and Pacific waters during the second World War these vessels proved their ability to dodge forward through heavy gunfire, sink big warships, and escape again with little or no damage to themselves. (*See also Boats and Boating*.)

**MOUND BUILDERS.** Scattered over the eastern half of the United States, especially in the Mississippi Valley and around the Great Lakes, are great numbers of earth mounds, many of them in regular geometrical shapes and others that rudely resemble bears, birds, snakes, and other animals. Who were the builders of these mysterious structures? Once it was believed by many that they were some unknown "lost race," distinct from the Indians discovered by the early explorers. But today scholars generally hold that the "mound builders" and the prehistoric ancestors of the American Indians were the same people. They were skilful workers in stone, shell, and beaten metal.

The mounds were evidently the work of many different tribes at widely separated periods. Some of them served as burial places, others as emblems of tribal deities or totems, as places of sacrifice, and as defenses in time of war.

The Cahokia Mound in Illinois, near St. Louis, has a great base which covers 17 acres. The mound rises to a height of 100 feet. So many mounds once existed on the site of St. Louis that it is known as the "Mound City." The Great Serpent Mound in Adams County, Ohio, is one of the most famous of the animal form mounds. Its serpentine walls are 1,350 feet long. Near Newark, Ohio, is a complicated series of structures, one of which, a circle with a diameter of more than 1,000 feet, is used as the Licking County fair grounds. Wisconsin has large numbers of animal mounds, including the celebrated Elephant Mound near Wyalusing.

**MOUNTAIN ASH.** When the early frosts visit the mountain woodlands the berries of this American tree take on a golden-red and join their lavish display to the autumn festival of color. Long after the leaves have fallen away, its acid berries cling to the bare twigs, brightening the snow-clad hills and furnishing food to flocks of birds that winter in the north. The winter buds are very showy and swell to a considerable size before bursting in the spring. In the early spring the crisp shining foliage appears and this is soon followed by dense clusters of small whitish-green flowers which exhale a delicate perfume. The mountain ash does not thrive in the shadow of other trees, preferring the more barren spots of rocky slope or outstanding crag. The beauty of the tree has made it valuable for garden and parking purposes. Planted in rich soil, with plenty of light and room, the mountain ash will grow a trunk often two feet in diameter, and with a height of 30 feet.

The varieties of the mountain ash are many, the American species being native from Canada southward, flourishing especially in the Allegheny highland. In addition there is a Western mountain ash, found in Canada and the western part of the United States. The mountain ash of Europe differs considerably from the American species. In Scotland it is known as the "rowan tree," and many legends cluster about it.

The mountain ash bears no relation to the common ash, but gains its name from the resemblance of its leaves to those of the ash tree.

Scientific name of American mountain ash, *Sorbus americana*. Leaves compound, alternate, odd-pinnated, bright green above, pale underneath; flowers small, white, growing in large flat cymes; fruit, bright red-scarlet berries about the size of a large pea, with black spot at apex; bark dull brown, almost smooth.

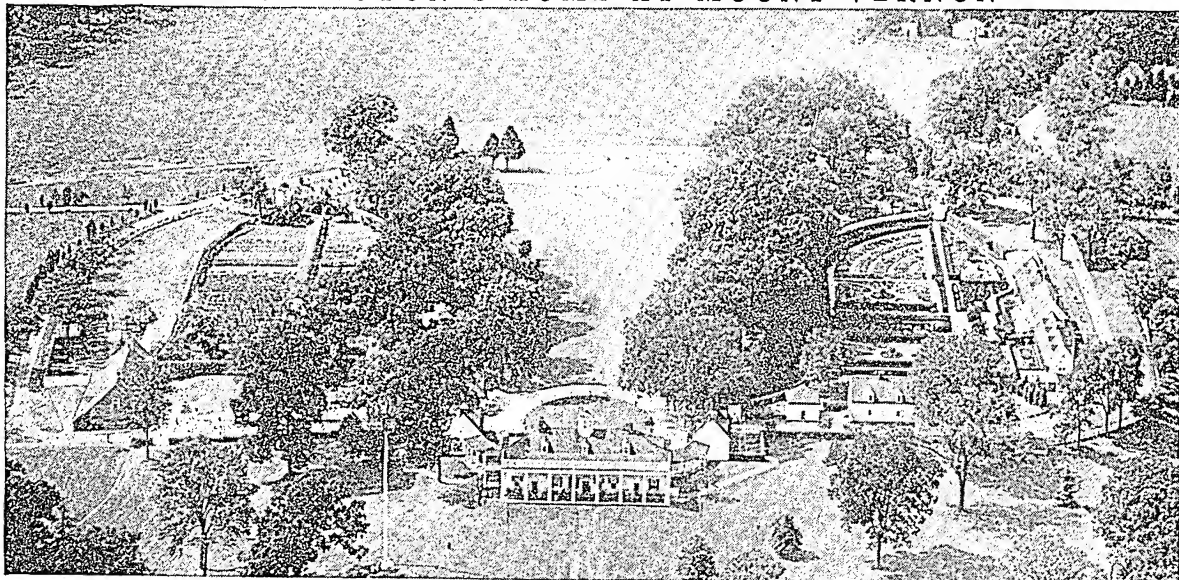
**MOUNTAINS.** Although a mountain is usually thought of as a peak of land rising to a high level above the surrounding country, isolated mountains are rare, the peaks being usually but points in long parallel ranges which extend for many miles like folds or tucks in the earth's surface. The loftiest mountains of the world are arranged with remarkable uniformity in two great belts, one constituting a "world girdle" and surrounding the Pacific Ocean, bordering four of the great continents; and the other extending in an east-west direction in Eurasia. The fact that mountains occur generally near the borders of con-

tinents suggests that the settling of ocean basins due to the shrinking of the earth over a cooling interior may have been one cause of their origin. High mountains exist also submerged in the sea, many chains having been discovered in the Pacific and Indian oceans. The highest mountains in the world are the Himalayas, the highest peak being Mount Everest (29,141 feet).

Mountain ranges have been formed in several ways: (1) All the great ranges are the result of "folding," a gradual upheaval due usually to some great pressure on the sides, which bends the rock layers upward like an arch. (2) Occasionally the rocks do not bend but break, or "fault," producing mountains which are steep and clifflike on one side, with gentle slopes on the other, like many in western North America. (3) Many mountains (for example, Pikes Peak) owe their existence to the gradual work of rivers in dissecting a plateau, leaving the hard rocks standing in bold relief. (4) Volcanic cones are formed by lava eruptions (see Volcanoes). In the formation of many

to which they often give rise on one side by causing the winds to drop most of their moisture before passing over them. On the other hand, however, they are the source of the great rivers which develop plains, and they furnish many valuable minerals. Lofty mountains have been almost as effective as the oceans in serving as barriers to the movement of men and animals and the spread of plants. No railway has yet been laid across the Himalayas, which for ages separated India and China from each other; and until 1910 no railway crossed the Andes. The Appalachian barrier helped to confine British colonies to the seaboard for 150 years; the Pyrenees shut off Spain from Europe so completely that it is often said, "Africa begins at the Pyrenees"; and for centuries the Alps acted as a barrier between Italy and Germany. Because of this separating tendency, and the protection which they afford from invasion, mountains frequently serve as political boundaries. (See also Physiography, and separate articles under the names of different mountains.)

#### WASHINGTON'S HOME AT MOUNT VERNON



This is the famous mansion overlooking the Potomac River where George Washington lived and where he lies buried. Thousands of visitors each year make the pilgrimage to this most venerated of America's historic relics. The estate was originally called "Little Hunting Creek Plantation," but was named Mount Vernon by Lawrence, Washington's half-brother, in honor of his former commander, Admiral Edward Vernon. George Washington had the original villa enlarged into the present mansion house and planned and superintended the construction of outbuildings and the adornment of the grounds. Many of the trees now growing on the estate were planted by Washington, Franklin, Jefferson, and Lafayette.

mountains all four processes have had a part. As soon as mountains begin to rise, erosion commences and continues until they are worn down to a plain, unless they are again uplifted. All lofty mountains, like the Rocky Mountains or American Cordilleras, are comparatively young. The Appalachian mountains are in a mature stage, and the Laurentian Plateau, which has been worn down almost to a plain, has reached old age.

Mountains greatly decrease the habitable area of land by their own ruggedness, and also by the aridity

**MOUNT VERNON, VA.** Any American citizen who is asked today what he considers the most interesting historic spot in his country will likely reply, "Mount Vernon," the home and the burial place of George Washington. On a high bluff overlooking the Potomac River, 15 miles below Washington, we may still see this delightful old mansion-house, built of wood but painted to resemble stone. Inside you will find the rooms much as they were in Washington's time; for when the Mount Vernon Ladies' Association, in 1859, bought 200 acres of the old estate, including



the house, they undertook to restore it to the condition in which it was when "the Father of his Country" was alive. Much of the furniture, especially that in the library and in Washington's bedroom, is the furniture which he used; and in the other rooms, where the Association was unable to buy back the same furniture, they purchased articles of the same kind. The coach in the coach-house, for example, is not the one that Washington used in visiting neighboring planters, but it was built by the same man and is exactly like the one Washington owned. The grounds and the gardens surrounding the house are just as they were laid out by Washington, and some of the trees were planted by his own hand.

But although the house and the home grounds are the same as they were at the beginning of the 19th century, the princely estate that was attached is gone. Then Mount Vernon was a plantation of more than 8,000 acres, instead of the 200 acres which it now includes. The division into five farms, however, was made in Washington's time. The part we know as Mount Vernon was then included in the "Mansion-House Farm," and on this were the house of the owner, quarters for the slaves, the butler's house, and the spinning house. On each of the other farms were "an overlooker's house," quarters for slaves, barns and stables; and on one of the farms was the old fishery and the ferry to the Maryland side of the Potomac.

At first Washington, like most Virginia planters, was engaged in tobacco raising; but he soon discovered that this crop exhausted the land too much, and so turned to a variety of crops. Each year some of the land was allowed to "lie fallow," or remain idle to restore its fertility, for scientific rotation of crops was little understood either by Washington or his neighbors. On the whole, though his estate was large, it did not yield Washington a great return.

**MOUSE.** Here are some verses about the mouse you may not know:

All dressed in gray, a little mouse  
Has made his home within my house;  
And every night, and every morn,  
I say, "I wish that mouse were gone."  
But why? A quiet soul is he  
As anyone may wish to see.  
My house is large, my hearth is wide,  
There's room for him and me beside.  
Ah! yes; but when the lights are out  
He likes to slyly creep about,  
And help himself to what he sees,  
Without once saying, "If you please."

Perhaps we shouldn't mind it so much if the little unmannerly rogue were alone, but the mouse is a social animal and likes to have his family with him. His family is not only large but it constantly increases at a surprising rate. Mice breed about six times a year, and there are about six baby mice in a litter; and the young mice breed when they are four months old. Therefore, if a pair of mice enter a home and have good luck and no deaths in their family, under normal conditions they increase in a year to 434, and at the end of the second year they number 65,778.

The house mouse was a native of Asia, but it is now found in every part of the world, wherever human beings have their habitations. It is everywhere hunted for the harm and mischief it does, but it flourishes nevertheless. The harm it does amounts to millions of dollars each year. It not only helps itself to our food, but it destroys or damages books, pictures, clothing, and furniture.

Field or meadow mice (sometimes called "voles") are larger than the house mice and more harmful but less widely distributed. They feed on grass, grain, fruit, and vegetables. Some seasons, for reasons that are not well understood, they increase abnormally and appear in such numbers that they overrun and destroy entire crops of grain, clover, or alfalfa. They also damage trees, shrubs, and flowers by gnawing the roots and bark. Large orchards are sometimes completely destroyed by them. Nurseries, vineyards, and berry plants are frequently damaged, and sometimes completely destroyed by mice.

Several species of mice are peculiar to the South, such as the harvest mouse, the rice-field mouse, and the grasshopper mouse. The latter is a beneficial form, as it lives almost entirely on grasshoppers, bugs, worms, and other mice.

One of the most interesting members of the mouse family is the Scandinavian lemming, which is remarkable for its habit of periodically migrating in vast swarms (see Migration of Animals).

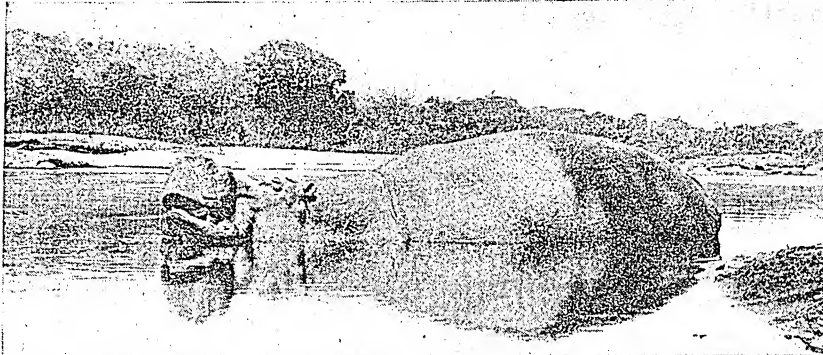
Mice represent the smallest members of the great family known as rodents, or gnawing animals. They are harmful because of their numbers and their rapid increase. Fortunately they have many natural enemies—hawks, owls, crows, and shrikes, and cats, weasels, minks, skunks, foxes, coyotes, and bears. The great Alaskan bears spend much of their time during the summer hunting meadow mice. Scientific name of house mouse, *Mus musculus*; of meadow mouse, *Microtus pennsylvanicus*.

#### HIS FAVORITE FOOD



Mr. Mouse has been disturbed while dining upon cheese. He looks harmless enough, doesn't he? Yet he does an enormous amount of damage.

## THE "RIVER PIG" OF THE LIMPOPO



The "great grey-green, greasy Limpopo," of Kipling's tale, is a real river that flows through Mozambique. It is often called the Crocodile River, but the hippopotamus is also at home here.

**MOZAMBIQUE** (*mō-zām-bēk'*). More than four centuries ago the Portuguese explorer Vasco da Gama sailed around the south of Africa and discovered this region on the southeast African coast. His reports of its gold trade led Portugal to send a fleet to establish its power, and ever since Mozambique (also called Portuguese East Africa) has been a Portuguese possession. Yet this immense colony—larger than the state of Texas, larger than any European country except Russia, and nearly nine times as large as its mother country—is still largely undeveloped, and the natives live much as they did four centuries ago.

Why has there been so little progress? One reason is that the climate of the swampy coast lands is unfavorable to white people. Lying south of the equator—about 700 miles distant in the north and 1,800 miles in the south—Mozambique has a coastal climate varying from tropical to subtropical. The moist heat of the summer months, November to April, is depressing and enervating. Still worse is the mosquito period which follows, bringing malaria and other fevers. The uplands and plateaus of the interior are more healthful, but the Portuguese have lacked capital for their development, and government policy has not favored colonization.

The country's chief importance is as a gateway to British colonies—Tanganyika to the north, and Nyasaland, Rhodesia, and the Union of South Africa to the west and south. The world's richest gold fields, centering in Johannesburg, find their chief route to the sea by way of Mozambique's capital, Lourenço Marques. A railroad connects these two cities, which are only about 300 miles apart. Beautifully situated on Delagoa Bay, Lourenço Marques looks much like a European city. Its population of some 45,000 is about one-fourth white. Beira (population, about 25,000), on the Bay of Sofala, is the terminus of a railway to Rhodesia. The city of Mozambique, the former capital, built on a coral island, is not so important as it once was.

Climate and soil are in general suited to agriculture, but only a small fraction of the province is under cultivation. This is due in part to the tsetse fly, which makes it impossible to keep horses and cattle. Enough sugar is raised to supply most of the

needs of Portugal. Corn, cotton, coconuts, citrus fruits, sisal, rice, and tobacco are also grown; but the total value of exports is small. Mangrove forests along the coast yield bark for tanning leather, and there are valuable hardwoods.

Gold, silver, tin, and coal are mined to some extent. The many remains of ancient gold workings lead some to believe that the biblical land of Ophir where Solomon obtained gold was in this region.

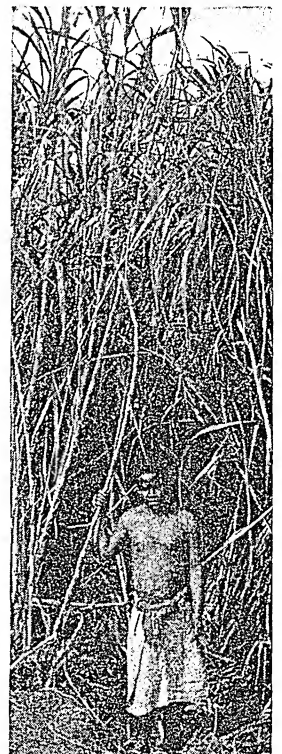
In October, before planting grain, the native burns a patch of grass and timber. When a piece of land proves unproductive, another is burned over. This wasteful method results in deforestation of large tracts. The gardens are usually cared for by the women and children. Only the crudest implements are used—the machete, which is a stout, swordlike knife, and a short-handled hoe used as a plow.

The villages are clusters of mushroom-shaped huts woven of grass or reeds. Both men and women wear only a few yards of cloth wrapped around the body. Corn and sorghum are the staple diet. The women pound these grains in a mortar, then rub the coarse meal between two stones. The flour is boiled to make a sort of porridge. Fish, vegetables, and fruits add variety to the diet.

The natives are chiefly of Bantu stock. They vary in color from extremely dark to comparatively light, probably because of the admixture of Arab and European blood. They are a sturdy people, primitive and superstitious, but not vicious.

Mozambique has an area of nearly 300,000 square miles and a population of about 4,000,000, of which the whites are less than one per cent. The coast is 1,380 miles long, almost as long as that of California. The interior mountains rise as high as 8,800 feet. Many rivers flow to the sea, the largest being the Zambezi and the Limpopo. Crocodiles haunt their banks; there are hippopotamuses and rhinoceroses in the swampy lowlands, and elephants, leopards, and other wild animals in the forests. (For maps, see Africa; East Africa.)

## SUGAR CANE



Natives do the work on the sugar plantations, which are owned by chartered companies.

**MOZART** (*mō'tsärt*), **WOLFGANG AMADEUS** (1756-1791). A winning child genius, petted by sovereigns and princesses, a brilliant youthful composer, acclaimed by his peers as "the musician of musicians" and "the only musician in the world"—the artist-drudge of a penurious emperor, harried by debt, privation and overwork to an untimely death, and allowed through cold neglect to go unattended to a pauper's grave—such were the strange contrasts in the life of the "divine" Mozart.

He was born at Salzburg, Austria, where his father was musical director for the archbishop. At the age of three he displayed such interest in the music lessons of his elder sister that the father, a thorough musician, began to give the boy regular daily lessons. When five he not only played the harpsichord well, but also had composed a number of short pieces. When seven years old he went with his family on an extended musical tour. He was a very sweet innocent child. When he slipped on the polished floor of the emperor's castle in Vienna and was picked up by beautiful Marie Antoinette, later queen of France, he said: "You are very kind; when I grow up I will marry you." Everywhere he won great applause by his organ and violin playing. From Paris he was taken to London, where his playing amazed all who heard him. During his stay of over a year in England he composed 10 sonatas for the clavier (an early form of the piano) and violin, six of which were published.

When 13 years of age Mozart was taken to Italy and for two years traveled from city to city, giving concerts. In Rome he was taken to the Sistine Chapel to hear a famous musical composition of which no copy had ever been published. After hearing it once Mozart was able to write it out entirely from memory.

While in Rome the pope conferred upon him the Order of the Golden Spur, making him, at 13, a "chevalier" or knight. When in Milan he composed an opera which was so popular that it was sung for 20 nights in succession. After his return to Salzburg, Mozart was twice recalled to Italy to direct his compositions for special occasions.

For the next 13 years he gave concerts and composed. The list of his compositions is very long, including operas, symphonies, masses, and other forms of sacred music, besides numerous smaller pieces.

At the age of 26 Mozart married. During the next five years some of his finest compositions were pro-

duced, including 'The Marriage of Figaro', and 'Don Giovanni', two of his finest operas. But although these were received with the greatest enthusiasm, the financial recompense to Mozart was comparatively small. The emperor appointed him to a position at the Austrian court, but the salary was low. His wife

was extravagant and a poor business manager and Mozart found it demanded all his powers to keep his growing family from want. To help out he took pupils and produced numerous compositions, all the while filling his post at court.

Under the strain his health began to break. During the year 1791 he was engaged on three of his greatest compositions. Besides two operas, he had received a commission to compose a requiem or funeral service, the purpose of which was kept secret. The mystery surrounding the order made a strange impression on Mozart, for in his weakened condition he became convinced that it was his own death dirge that he was composing.

Such it proved to be, for just before it was finished the busy brilliant life of Mozart ended, apparently from typhus fever. There were debts, and there was no money. His wife was ill, and no friends came to aid. So his body was hastily buried in a pauper's grave in one of the cemeteries of Vienna.

Of Mozart's operas the 'Magic Flute' is perhaps his best. Of his many symphonies the one known as the 'Jupiter' symphony is by many considered the finest, and is so masterly it is difficult to believe that it was composed in 15 days. His quartets are equaled only by those of Haydn and Beethoven. His sacred music is churchly and beautiful. The 'Requiem' is the greatest of its kind, and has been used in the funeral services of innumerable musicians.

**MUDFISH.** "Can a fish live out of water?" "No," says the "man in the street." Then the keeper of the New York Aquarium opens a package he has just received from far-away Africa, and finds inside a ball of dried mud. It is hard to crack open, so he drops it in one of his big fresh-water tanks. The mud melts away, and suddenly, out of the black mass, a long lively, eel-shaped creature uncurls, stretches, and swims happily away, looking for food!

Scientists call this fish *Protopterus annectans*. The negro boys in his native land probably have a shorter name for him; but he has not yet been naturalized in America or England, so we give his family title of African "mudfish" or "lung-fish." He has a close relative living in the South American river swamps, called by the Indian natives *lolach*; and a more distant cousin in Australia, called *barramunda*.

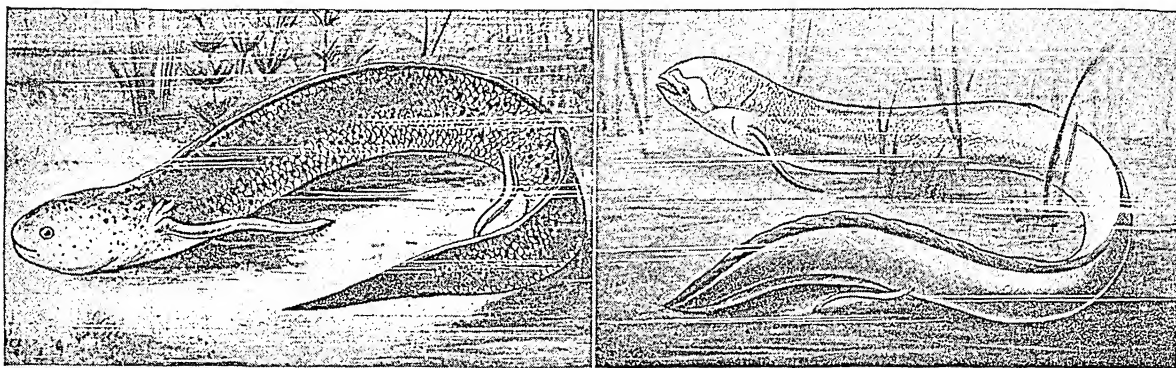
#### THE BOY MOZART



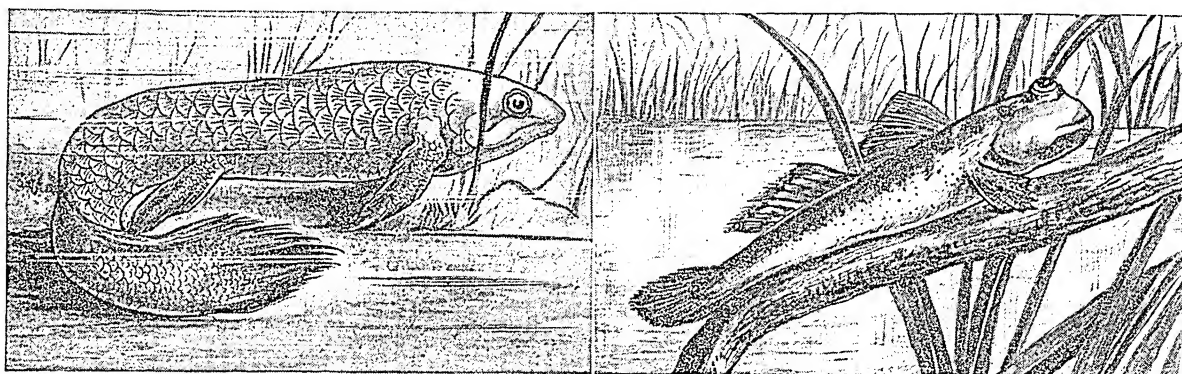
The young musician is shown here with his violin—the violin with which he played his way into the hearts of all Europe. This statue by the French sculptor Barrias stands in the Luxembourg Museum in Paris.



## THE QUEER MUDFISH AND THEIR QUEERER WAYS

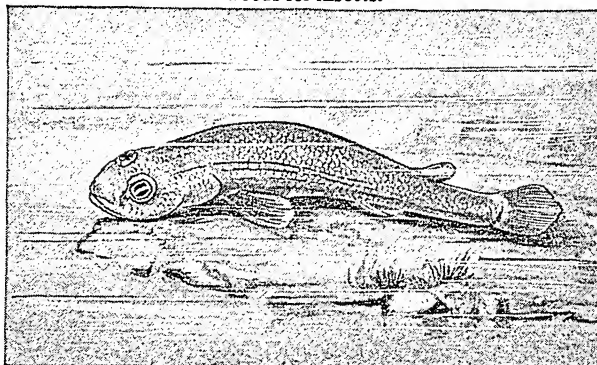


Here are two members of the queer Lungfish order, which doesn't seem able to make up its mind whether to be fish or not. The African Mudfish on the left, for example, is a clever swimmer, yet he often ambles about in shallow water on those pipe-stem legs. The South American Mudfish on the right has a prodigious appetite, and, during the wet season, lays up fat on which he lives, buried sound asleep in the mud, during the dry season.



These three fish are what naturalists call "anachronisms"—that is, they are survivals from an earlier day, now long out of date. When the world was several million years younger than it is today, this family of water creatures was very large, but these three widely scattered species are now the only living members. Besides the gills with which all fishes breathe under water, these fishes have lungs, which they use when their native swamps dry up in summer, or when the mud gets too thick. The African and South American lung-fishes build mud cells for themselves, and they can then be dug up and shipped long distances in these "cocoon." They are usually 12 to 18 inches long. The barramunda of Australia grows much larger, sometimes reaching a length of six feet or more. He does not build a permanent summer cell, but uses his

At the left is the Barramunda, the third living member of the Lungfish order, the *Dipnoi*. He lives in Australia, and you can often tell when he is breathing at the surface, because of the grunting noise he makes. At the right is another oddity of the fish world—the "mud skipper," or East Indian Goby. He well deserves his nickname, for he often climbs out upon a convenient log or upon the shore and hops about on those front fins of his, hunting through the weeds for insects.



This Four-Eyed Fish is in some ways the queerest of all. Do you see how his eyes are divided? The upper half is for seeing things in the air, and the lower half for seeing things under water, for this fish swims with his head half out, ready to jump after any flying insect or dive after any water bug.

lungs to breathe at the surface, making a grunting noise audible at long distances. All of these fishes have front and back fins that resemble somewhat in their bone structure the four legs of lizards and frogs. They are probably survivors of a race of creatures halfway between the true fish and the newt or salamander. Although a number of other fishes have some lung-breathing power, they are not properly classed as lung-fishes.

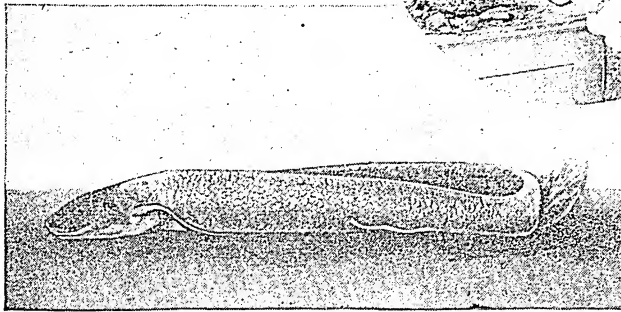
Another contradiction to the every-day rule that fish can't live out of

water is the "mud-skipper" or *goby* of East Indian rivers. He is a tiny creature, with front fins developed like the flappers of a seal, who comes out on shore and hops about, hunting through the weeds for small insects, which he devours greedily. Then again there is the *four-eyed fish* of tropical America,

so-called because his eyes are divided into two parts—the upper lens suitable for sight in the air, the lower for use in the water. He swims half in and half out of water and is able to see insects above or below the surface. When alarmed, this fish will skip like a grasshopper, two feet or more at a jump.

Another strange fish of this group is the Alaskan blackfish, which sometimes reaches a length of eight inches. He dwells in the swamps, and his vitality is great. It is said that, after being frozen for weeks in baskets and then thawed out, he is as lively as ever.

"FISHING" WITH A CHISEL



Inside that hard ball of mud is an African Mudfish. He has come all the way to America in this curious house. When the man gets him chiseled out and puts him in water, he will uncoil himself and swim away as lively as you please! The picture below shows just what he looks like after he has been let out. In his native home this Mudfish rolls himself up in this mud ball during the dry weather and waits for the rainy season to melt away his prison walls.

Among the North American mudfishes are the mud-minnows, the mummichog (who belongs to the killifish family), and the bowfin, which is common throughout the central part of the United States. All have the faculty of living happily in mud and can survive a long time out of water.

Scientific names: African mudfish, *Protopterus annectans*; lolach, *Lepidosiren paradoxa*; barramunda, *Neoceratodus forsteri*; mud-skipper, *Periophthalmus koelreuteri*; Alaskan blackfish, *Dallia pectoralis*. The first three make up the lungfish group of fishes, *Dipnoi*.

MUIR, JOHN (1838-1914). Evening had fallen in the high Sierras, shutting out the clustering snow-peaks and the jutting domes of glaciated rock. The stars were very bright and very near. A little band of campers sat around their fire in the cold of a mountain night, 50 miles from the nearest village. Suddenly beside them appeared a stalwart middle-aged man, with a great beard and deep far-seeing eyes. He carried on his back a single blanket and the scantiest food. It was John Muir, the great naturalist and explorer, on one of his lonely expeditions.

Half the night the campers sat around their little fire, fascinated, listening to strange tales of the mountains and of distant lands, told with a wealth of understanding in a soft Scotch burr. In the morning when they awoke John Muir had gone, vanished into the mountains from which he came.

All who love mountains loved John Muir, for never had mountains a truer friend than he. It is largely because of him that the Yosemite and the Sequoia

National parks were founded. For ten years he lived thus alone in the Sierra Nevada Mountains studying the rocks, the glaciers, and the forests, and only coming back to civilization at intervals when necessity demanded it. He discovered 65 separate glaciers and mapped out all the upper plateau.

He made several trips to Alaska, discovering Glacier Bay and Muir Glacier, and was a member of the Arctic expedition that searched for the De Long party in 1878. He also traveled in the Caucasus, Siberia, Manchuria, Japan, India, Egypt, Australia, and New Zealand. Born at Dunbar, in Scotland, he had come to America at the age of 11 and adopted the United States as his country. Four years were spent as a student at the University of Wisconsin, and he received honorary degrees from Yale and the University of California. Through his writings he awakened an interest in his beloved Sierras and carried some of their charm to thousands of readers.

Among his chief works are: 'The Mountains of California' (1894); 'Our National Parks' (1901); 'My First Summer in the Sierra' (1911); 'The Yosemite' (1912); 'Story of My Boyhood and Youth' (1913).

MULBERRY. Without the mulberry tree we should have none of the exquisite silks of commerce, for the silkworm does not thrive or produce the finest quality



These are mulberry twigs with the ripened fruit. The silkworms are put out to "pasture" on the leaves.

of silk filaments for its cocoon unless it has as its food the tender leaves of the white mulberry tree. Mulberries are found in the temperate regions of both the Old and New World and are cultivated for silk growing, for the fruit, and as ornamental trees. There are three well-known species, red, black, and white, named from the color of the fruit.

The white mulberry, the silkworm mulberry, is a native of China. It was brought to America when the early colonists attempted to raise silkworms. Though they failed to establish the silk-

worm culture as an industry, the white mulberry trees they imported have developed into some of the leading fruit varieties of North America. The chief centers of mulberry cultivation and of silk growing are China, Japan, India, France, Persia, and Turkey.

The black mulberry, the fruit-bearing mulberry of Europe, is not grown to any extent in the United States, though it has been known since earliest antiquity. It was introduced to Europe, it is believed, from Persia. Its large, dark purple, almost black fruit, which looks like a long slender blackberry, is very juicy and delicious.

The red mulberry, a native of North America, has fruit of a pleasing tartness, which relieves the sweetness characteristic of the fruits of all mulberry trees. In some parts of Europe this tree is cultivated in preference to other kinds because of its hardiness. None of the mulberries are planted extensively in North America, however, because the fruit is too soft

to market. In some of the western United States the Russian mulberry, a variety of the white, is planted as a windbreak. Some varieties are cultivated for their ornamental forms, the most popular in America being the weeping mulberry, a lawn tree whose slender branches droop to the ground.

A member of a closely allied genus is the paper mulberry, the bark of which is used for making paper in Japan. The islanders of the Pacific also make a fabric called "tapa cloth" from it by soaking the bark, removing the outer layer, and then laying the remainder on a smooth table and beating it until it has the required thinness.

Scientific name of white mulberry, *Morus alba*; black mulberry, *Morus nigra*; red mulberry, *Morus rubra*. The trees are small, the red mulberry, the largest species, only occasionally reaching a height of 60 feet. The leaves are interesting because they are so variable. Even the same tree may bear leaves of several forms, while different trees of the same species show strong individual shapes. (See Silk.)

## LEARNING MULTIPLICATION—A Simplified Method



**M**ULTIPLICATION. When a grocer counts eggs three at a time, he says to himself, 3, 6, 9, 12, 15, 18, 21, 24, etc. Each of these numbers is called a *multiple* of 3. He is adding three at a time, and the total is made up of threes.

When a carpenter measures a board with a two-foot rule, he names the multiples of 2 in succession—2, 4, 6, 8, 10, 12, 14, etc.—until he reaches the end. He is counting by twos, that is, by multiples of 2.

A boy who has 6 nickels may count his money by naming the multiples of 5 until he reaches 30 (5, 10, 15, 20, 25, 30), or he may "short-circuit" the counting by remembering that 6 fives are 30.

Finding the sum of a number of equal numbers is called *multiplication*.

When a girl thinks 4 weeks = 28 days, she is

multiplying. To multiply 7 by 4, she must remember the sum of 4 sevens ( $7+7+7+7$ ). The number multiplied or repeated is called the *multiplicand*. 7 is the multiplicand in this example. The number of times that the multiplicand is repeated is the number called the *multiplier*; 4 is the multiplier in this example.

Harry counts 10 ranks of soldiers marching 4 abreast. If he knows the multiplication table (Fig. 1), he can shorten the process by saying  $10 \times 4 = 40$ .

If he should forget what  $10 \times 4$  equals, what are the multiples that he must say to find the sum of 10 fours?  $4+4+4+4+4+4+4+4+4+4 =$  what number? What number is the *multiplicand* in this problem?

The number resulting from multiplying is called the *product*; 40 is the product of 4 and 10.

<i>multiplicand</i>	6
<i>multiplier</i>	5
<i>product</i>	30

Products of large numbers are found by calculating. To calculate readily the learner must commit to memory the elementary products shown above.

1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9
2	4	6	8	10	12	14	16	18
3	6	9	12	15	18	21	24	27
4	8	12	16	20	24	28	32	36
5	10	15	20	25	30	35	40	45
6	12	18	24	30	36	42	48	54
7	14	21	28	35	42	49	56	63
8	16	24	32	40	48	56	64	72
9	18	27	36	45	54	63	72	81

Fig. 1



Eliminate the combinations in lighter type because  $2 \times 3 = 3 \times 2$ ,  $2 \times 4 = 4 \times 2$ , etc., so the combinations in black type give all the variations necessary. Forty-five combinations remain. Repeat oftenest the last four lines (ten combinations in all), as they are the most difficult, viz:

$$\begin{array}{r} 6 \times 6 \quad 6 \times 7 \quad 6 \times 8 \quad 6 \times 9 \\ 7 \times 7 \quad 7 \times 8 \quad 7 \times 9 \\ 8 \times 8 \quad 8 \times 9 \\ 9 \times 9 \end{array}$$

This table is usually known as the multiplication table. The facts it summarizes may be more easily remembered if studied in connection with drawings or other constructive work.

#### Developing the Multiplication Table

Cut 100 one-inch squares of paper. Lay them in rows as shown in Fig. 2.

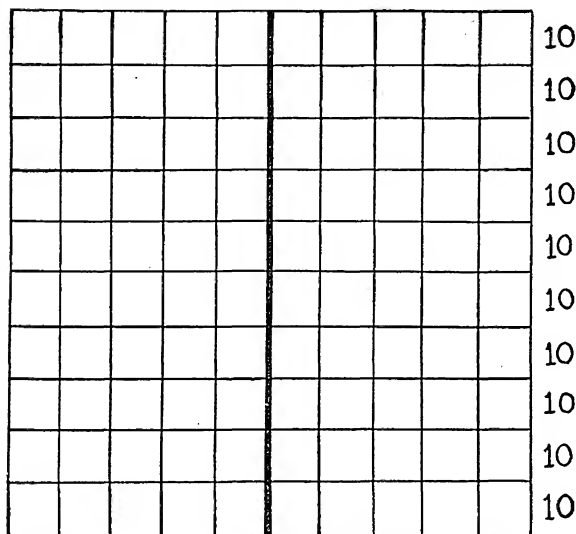


Fig. 2

1. Count the squares by rows—10 at a time—thus: 10, 20, 30, etc.

2. How many squares in 3 rows? 7 rows? 5 rows? 9 rows? 4 rows?

3. Edwin has 8 dimes. How many cents has he? 6 dimes = how many cents?  $8 \times 10 =$  how many?  $10 \times 10$ ?  $2 \times 10$ ?  $5 \times 10$ ?

4. Copy this table and fill the blanks:

$$\begin{array}{r} 1 \times 10 = \quad 6 \times 10 = \\ 2 \times 10 = \quad 7 \times 10 = \\ 3 \times 10 = \quad 8 \times 10 = \\ 4 \times 10 = \quad 9 \times 10 = \\ 5 \times 10 = \quad 10 \times 10 = \end{array}$$

5. Lay squares in rows of 5; count them by fives.

6. Lay 5 rows of 10 squares each. Lay 10 rows of 5 squares each. How many squares in each group?

7. Compare  $10 \times 5$  with  $5 \times 10$ . Fill the blanks:  $50 = \quad \times 5 = 5 \times \quad$ .

8. Cut two strips of paper each 10 inches long and 1 inch wide (Fig. 3).  $2 \times 10 =$  what number? Cover these strips with inch squares by placing 2, then 2 more, etc. How many twos = 20?

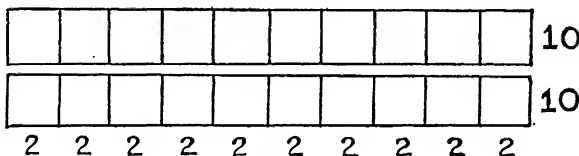


Fig. 3

Finish the table by filling the blanks:

$$\begin{array}{r} 1 \times 2 = \quad 3 \times 2 = \quad 5 \times 2 = \quad 7 \times 2 = \quad 9 \times 2 = \\ 2 \times 2 = \quad 4 \times 2 = \quad 6 \times 2 = \quad 8 \times 2 = \quad 10 \times 2 = \end{array}$$

9. Lay 2 rows of 9 squares each.  $2 \times 9 =$  what number? Find this number by counting the squares by twos.

10. Add:

$$\begin{array}{r} 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \\ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \end{array}$$

Complete:

$$\begin{array}{r} 2 \times 1 = \quad 2 \times 3 = \quad 2 \times 5 = \quad 2 \times 7 = \quad 2 \times 9 = \\ 2 \times 2 = \quad 2 \times 4 = \quad 2 \times 6 = \quad 2 \times 8 = \quad 2 \times 10 = \end{array}$$

11. Lay squares to show 10 threes. Count 30 by threes. Complete the following table of threes to  $10 \times 3$ :

$$\begin{array}{r} 1 \times 3 = 3 \quad 3 \times 3 = 9 \\ 2 \times 3 = 6 \quad 4 \times 3 = 12 \end{array}$$

12. Show with squares that  $3 \times 6 = 6 \times 3$ ;  $3 \times 7 = 7 \times 3$ ;  $3 \times 8 = 8 \times 3$ ; and  $3 \times 9 = 9 \times 3$ :

13. Complete the following statements by filling the blanks:

$$3 \times 6 = \quad 3 \times 7 = \quad 3 \times 8 = \quad 3 \times 9 =$$

14. Add:

$$\begin{array}{r} 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \\ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \\ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \end{array}$$

15. Lay squares and develop the tables of 4 thus:

$$\begin{array}{r} 1 \times 4 = 4 \quad 4 \times 1 = 4 \\ 2 \times 4 = 8 \quad 4 \times 2 = 8 \\ 3 \times 4 = 12 \quad 4 \times 3 = 12 \\ 4 \times 4 = 16, \text{ etc.} \quad 4 \times 4 = 16, \text{ etc.} \end{array}$$

16. In the same way make tables of 5; 6; 7.

17. How many squares on a checkerboard (Fig. 4)? Count one row. Count the number of rows. Count the black squares by fours. Count the white squares by fours. Add 32 and 32. Show that  $8 \times 8 = 64$ .

18. Count 32 by eights. Show that  $5 \times 8 = 8 \times 5$ . Count 48 by eights.

19. Show the product of  $7 \times 8$ .

$$\begin{array}{r} \text{Solution:} \quad 5 \times 8 = 40 \\ 2 \times 8 = 16 \\ 7 \times 8 = 56 \end{array}$$

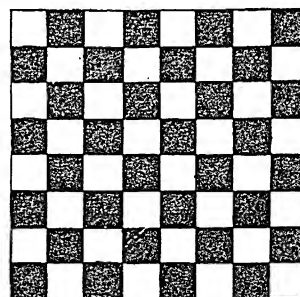


Fig. 4

20. Count 64 by eights.

21. Develop the table of nines. To count by nines, add 10 each time and subtract 1.

$$\begin{array}{r} 2 \times 9 = 9 + 10 - 1 = 18 \\ 3 \times 9 = 18 + 10 - 1 = 27 \\ 4 \times 9 = 27 + 10 - 1 = 36 \\ 5 \times 9 = 36 + 10 - 1 = 45 \\ 6 \times 9 = 45 + 10 - 1 = 54; \text{ etc.} \end{array}$$

Notice how the multiples of 9 are paired in the table at the side. Observe the table closely and tell all you can about the order of the figures, the sum of the figures in each number, etc.

Complete the table below:

$$\begin{array}{ll} 1 \times 9 = 9 & 3 \times 9 = 27 \\ 2 \times 9 = 18 & 4 \times 9 = 36 \end{array}$$

22. Show that  $3+3+3+3+3=5+5+5$ .

23. Show that  $5 \times 9 = 9 \times 5$ ; that  $8 \times 3 = 3 \times 8$ .

**Principle.** The multiplicand and multiplier can exchange places without changing the product.

### Multiplying Numbers Greater than 10

**Examples:**

1. Find  $2 \times 12$  (Fig. 5).

**Solution:** First form: 
$$\begin{array}{r} 12 \\ 2 \\ \hline 24 \end{array}$$
 Sum

Second form: 
$$\begin{array}{r} 12 \\ 2 \times 2 = 4 \\ 2 \times 1 \text{ ten} = 2 \text{ tens.} \\ \hline 24 \end{array}$$
 Product

**Answer:**  $2 \times 12 = 24$ .

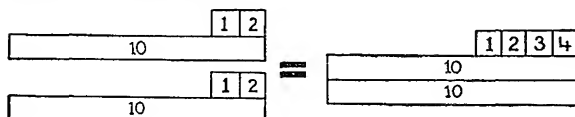


Fig. 5

2. Find  $2 \times 20$ .  $2 \times 30$ .

**Solutions:**  $2 \times 2$  tens = 4 tens. 2 times 3 tens = 6 tens.

3. Find  $2 \times 27$  (Fig. 6).

**Solution:**

$$\begin{array}{r} 27 \\ 2 \\ \hline 54 \end{array}$$

or:

$$\begin{array}{r} 2 \times 7 = 14 = 1 \text{ ten and 4 ones.} \\ 2 \times 2 \text{ tens} + 1 \text{ ten} = 5 \text{ tens.} \\ 2 \times 27 = 54. \end{array}$$

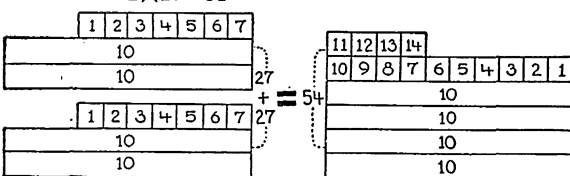


Fig. 6

Accuracy and speed in multiplication are acquired in these ways: (1) By mastering the "fundamental facts" in tables; (2) by computing with as few words as possible in mind; (3) by writing numbers in straight rows and columns; (4) by forming the habit of testing the correctness of all answers.

As an illustration of how few words it is necessary to have in mind, the following problem may be used. In multiplying 9 by 4, think "36." In multiplying 279 by 4 and adding 3, think "28," "31." In multiplying 2 by 4 and adding 3, think "8," "11."

In writing the partial products be careful to keep units under units, tens under tens, and so on. This is particularly important in multiplying by a number in which one or more zeros occur, as in the accompanying example.

The tests used commonly to determine the correctness of a product are: (1) Repeat-

ing the operation; (2) changing the position of the multiplicand and multiplier and multiplying again; (3) dividing the product by either the multiplicand or multiplier. In either case the quotient should be the other factor.

To save time in multiplication it is convenient to know the following short cuts:

To multiply by 10, annex a zero to the multiplicand.  
To multiply by 100, annex 2 zeros to the multiplicand.  
To multiply by 1000, annex 3 zeros to the multiplicand.  
To multiply by 25, annex 2 zeros and divide by 4.  
To multiply by 50, annex 2 zeros and divide by 2.  
To multiply by  $12\frac{1}{2}$ , annex 2 zeros and divide by 8.  
To multiply by  $16\frac{2}{3}$ , annex 2 zeros and divide by 6.  
To multiply by  $33\frac{1}{3}$ , annex 2 zeros and divide by 3.

Can you invent a short way of multiplying a number by 11? By 99, using subtraction?

The accompanying drill chart will help fix in your mind the facts of the multiplication table. Draw it upon your blackboard, or upon a large sheet of paper, place a number in the center for the multiplicand, and give quickly the product as someone points now to one multiplier and now to another. Change the multiplicand from time to time.

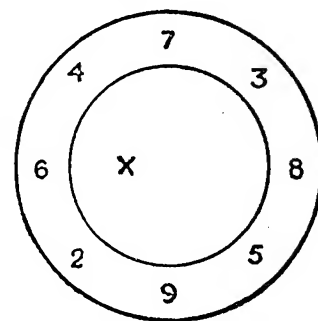


Fig. 7

### Curiosities of Multiplication

Many strangely symmetrical tables have been developed by students of mathematics. One of the most interesting is that which results from the multiplication of numbers consisting entirely of 1's.

$$\begin{array}{lll} 1 \times 1 & = & 1 \\ 11 \times 11 & = & 121 \\ 111 \times 111 & = & 12321 \\ 1111 \times 1111 & = & 1234321 \\ 11111 \times 11111 & = & 123454321 \\ 111111 \times 111111 & = & 12345654321 \\ 1111111 \times 1111111 & = & 1234567654321 \\ 11111111 \times 11111111 & = & 123456787654321 \\ 111111111 \times 111111111 & = & 12345678987654321 \end{array}$$

From this we can form a mechanical rule for the formation of such products: To multiply a number composed entirely of 1's by itself, write the number which represents the sum of the digits in one factor (which, in order that the rule shall hold, must be less than 10), and symmetrically to the left and right of it, write the digits less than that one, in natural decreasing order. For example, to multiply 11111 by 11111, write 5, the number of digits in either factor, and symmetrically to the right and left of it, the natural decreasing order of digits less than 5, i. e., 4, 3, 2, and 1, which give the product 123454321.

Other interesting tables are these:

$$\begin{array}{lll} 7 \times 7 & = & 49 \\ 67 \times 67 & = & 4489 \\ 667 \times 667 & = & 444889 \\ 6667 \times 6667 & = & 44448889 \\ \text{etc.} & & \\ 9 \times 9 & = & 81 \\ 99 \times 99 & = & 9801 \\ 999 \times 999 & = & 998001 \\ 9999 \times 9999 & = & 99980001 \\ \text{etc.} & & \end{array}$$

**MUMMY.** In the great museum of Egyptian antiquities at Cairo, throngs of curious sightseers daily look into the very faces of the pharaohs and nobles of Egypt who ruled from 3,100 to 3,500 years ago. Thousands of such mummies or embalmed bodies have been taken from the sands and tombs of Egypt, and perhaps millions more yet lie hidden; for the Egyptians practiced the art of mummifying their dead for 3,000 years or more, believing that the soul would some day return to the body and occupy it again. The bodies were preserved by the use of bitumen, spices, gums, etc., or sometimes by immersion in honey; and after a 70-day process were wrapped carefully in linen.

Then the shrouded mummy was usually placed in two cases of cedar, or of a sort of papier-mâché made to fit the corpse. The inner case was plain, but the outer one was often covered with elaborate paintings and hieroglyphs telling of the life and various deeds of the deceased. A molded mask of the dead or his portrait on linen or wood sometimes decorated the head end of the case. This double case was placed in an oblong coffin and deposited in a sarcophagus. The bodies of the poor were merely dried with salt and wrapped with coarse cloths. Sacred animals—lions, dogs, crocodiles, birds, fishes, and even insects—were also mummified, and now and then whole shelves are unearthed filled with embalmed cats who centuries ago probably caught mice around the temples of Egypt.

The Egyptians surpassed in this art of preserving the body in a lifelike condition, but mummy making was practiced also in Peru and Mexico. The oldest mummy known to exist is supposed to date from about 3000 B.C. (See Egypt.)

**MUNICH** (*mū'nīk*), GERMANY. The "Athens on the Isar" is the name the people of Munich love to give to their city of palaces, museums, and parks, situated on the Isar River, and the capital of the former kingdom of Bavaria. There are, indeed, few modern cities which come nearer to the artistic ideals of ancient Athens.

Most great cities owe their fame to advantage of location, or to some fortunate accident of history, but the greatness of Munich (German "München") is largely the result of one man's deliberate policy.

Early in the 19th century, King Ludwig I of Bavaria decided to make his capital one of the leading art centers of the world. He succeeded in doing so, at enormous cost, after years of planning and labor on the part of leading architects, sculptors, and collectors.

The broad streets of the city today are lined with beautiful buildings copied from the world's most famous structures. And in these buildings may be studied the art and industry of mankind since ancient times. Bas-reliefs wrought by the Babylonians and Assyrians can be compared with the work of modern sculptors. On the walls of one famous gallery (in the Old Pinakothek) hang the paintings of the old masters, and just across the

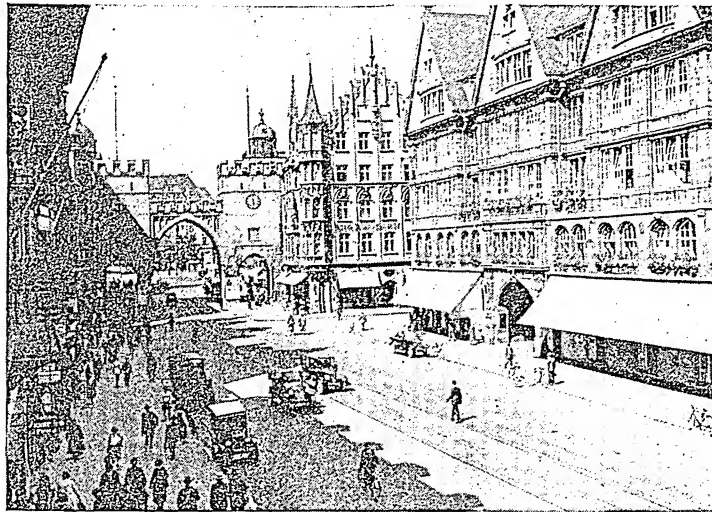
street (the New Pinakothek) are exhibited those of our own day. Weapons, household utensils, and other articles from the Stone Age to the present time are arranged in chronological order in the Bavarian National Museum, each room of which is built to harmonize with the period it represents, and to illustrate the march of progress through the centuries. At the Bavarian National Theater, famous musicians may be heard each night rendering the music of the great composers. The National Library contains 30,000 rare manuscripts, and 1,300,000 printed volumes. The university, the academy of science, and the schools of music and painting attract students from all parts of the world.

All this was the creation of King Ludwig. Before his reign Munich was a second-rate town, while today it ranks among the first cities in Germany.

But the presence of so much classic art and solid learning has not made Munich a solemn city. Its people have long been renowned for their carefree gaiety, and during the carnival season, just before Lent, the whole city becomes a big playground. Masked crowds, in brilliant costumes, throng the streets and parks, and bright-colored confetti and paper streamers fill the air, as the revelers pelt each other with these harmless missiles. Special celebrations are held during the "October festival" in a park southwest of the city, where stands a bronze statue 62 feet high, representing Bavaria.

Aside from art and education, the great industry of Munich is the brewing of beer. It has been said

IN THE HEART OF MUNICH



Munich is famous for its fine buildings, and the broad Neuhauser Street which we see in the picture has a very modern air. In the background is the Karlstor, one of several old city gates which still remain, though the old city wall is torn down. At the right is the Oberpollinger department store.



that if all the beer made here in one year were put into barrels, the line of these would reach from Boston clear across the United States to San Francisco. The beer is also of a superior quality, due not only to the excellence of Bavarian hops, but also to peculiarities of the water. One brewery which makes a highly esteemed beer is said to get all its water from one small spring.

Besides its beer, Munich is celebrated for artistic handicrafts, such as bronze-founding, glass-staining, silversmith's work, wood carving and lithography, the latter having been invented in Bavaria in the 18th century. Other industrial products are wall paper, railway machinery, gloves, and artificial flowers.

In the course of the revolution of 1918-19 which drove the Bavarian king from his throne and established the Bavarian republic, Munich was the scene of violent "Spartacan" (Bolshevist) uprisings. These were soon mastered, however, and an orderly republican government was established without delay. Population, about 830,000.

**MUNICIPAL GOVERNMENT.** When a man lives in the country, he is usually able to provide himself with the necessities of life and to determine largely his own manner of living. But as population grows in a community, new needs come into existence which concern the welfare of many people. Fire and police protection, sidewalks, street lights, and sanitation are a few of the many necessities which call for central management and a common expense fund. Usually these problems are solved by organizing the community into a village or city. This is done by the state, which issues to the community a written permit to establish a government. This permit is called a charter; it tells very definitely the powers and limitations of the new government.

The governments of a village and of a city are much the same, except that the city government is more complicated. Each has three branches, the executive, the legislative, and the judicial. The mayor is usually the executive head of the city, and in American cities he possesses large powers. Under him and responsible to him are the heads of the different departments into which the government is divided, such as the police department, the water department, or the health department. The council corresponds to the legislature of the state. Its members, called aldermen or councilmen, are usually elected from the different wards of the city. As a rule, two or more members are elected from each ward for a term of two years. The powers of the council vary in different cities. In general, however, it enacts ordinances or local laws, and confirms or rejects the mayor's appointments to office. It can override a veto of the mayor by a two-thirds or a three-fourths vote. The judicial branch of the city consists of the city courts.

As a city grows, the departments increase in number and in importance and its government becomes more and more complicated and cumbersome. A number of cities, among them Boston, Mass., have

simplified administration by centering all executive powers in the mayor. This is called the federal plan because of its likeness to the organization of the national government.

A simpler and more direct form of government, called the commission plan, was instituted by Galveston, Tex., and Des Moines, Iowa. A group of commissioners, usually five, is elected by a majority vote of all the citizens, the wards being eliminated. Each commissioner becomes head of one of the departments of the government, and the commissioners meet together to pass necessary legislation. This form of government proved so successful that soon more than 400 cities in the United States were using it, though it is now declining in favor. Its chief difficulties are that it does not necessarily result in the election of persons with executive ability, that minority opinions are not represented in considering legislation, and that a few voters can change the entire administration at each election and can use this threat to influence the actions of the commissioners.

Out of the commission plan has grown what is popularly known as the city-manager or council-manager plan. This has been adopted by more than 400 cities, including Cincinnati, Dayton, and Toledo, Ohio; Kansas City, Mo.; Oklahoma City, Okla.; Fort Worth and Dallas, Tex.; and Rochester, N. Y. A council, usually elected at large, has the responsibility of determining policy. The details of administration are put in the hands of a manager who is hired by the council and may be summarily dismissed by it. The manager makes all appointments of subordinates. The chief advantage of this system is that the determination of policy is left where it belongs, in the council, while no politics prevail in the administrative branch of the government.

To give minorities a voice, New York, Toledo, Cincinnati, and other cities have adopted the Hare system of proportional representation. Under this, if, say, five members are to be elected to the council, a minority amounting to one-fifth of the voters is bound to elect a representative of its views.

**MURILLO** (*mū-rīl'ō*, Spanish *mū-rēl'yō*), BARTOLOMÉ ESTEBAN (1617-1682). A young man of about 25, footsore and exhausted from his 250-mile journey afoot across the Sierra Morena Mountains from Seville, arrived in Madrid one evening nearly 300 years ago. He was penniless, friendless, and very lonely and tired.

"Will you tell me where I can find Diego Velasquez, the court painter?" he asked a guitar player who was languidly strolling along the cobblestone road. The other eyed him with indifference as he gave the directions—not knowing that he was speaking to the man destined to be Spain's most beloved painter and one of her two world-artists.

This was a red-letter day in the life of Murillo, the poor Seville mechanic's son, who for two years had been earning a scanty living painting crude bright-colored pictures which he sold on the market place at

THE 'IMMACULATE CONCEPTION' BY MURILLO



Seville, and who had pluckily set forth to seek his fortune in the capital of Spain. For on this same evening the great Velasquez, recognizing the talent of his ambitious young fellow-townsmen, took the youth into his own home, and got permission for him to copy the art treasures in the royal galleries.

Murillo progressed so rapidly that in less than three years Velasquez exhibited some of his work to the king and court. He might now have looked forward to fame and prosperity in Madrid, but he preferred to return to his native Seville. Soon he executed 11 large paintings for the convent of San Francisco, which brought him immediate recognition. After this he married a rich woman of rank, became the head of the Academy of Seville, which he helped to found in 1660, and lived happily painting masterpieces—most of them religious works for the churches and convents of his beloved Seville—until a fall from a scaffold in 1681 brought injuries from which he died a year later. His body was buried in the church of Santa Cruz at Seville, and his generation mourned over the passing of their lovable, pious, popular, but unspoiled idol, their “angel painter born to paint the sky.”

Among Murillo's earliest pictures are many sympathetic realistic studies of the ragged urchins and flower girls whom he saw on the streets of his native city. His later works are nearly all serene inspired religious compositions, marked by splendid coloring, great technical skill, and intense feeling. The few portraits he painted are of great beauty and lifelikeness. So realistic was his style that a spaniel in one of his pictures has been known to make a living dog snarl, and birds are said to peck at the lilies in his wonderful ‘Saint Anthony of Padua’—that beautiful picture of the kneeling saint stretching forth his arms to the little Christ child.

Among Murillo's most famous pictures are three versions of the ‘Immaculate Conception’, two of which are in the Prado Museum in Madrid and the third in the Seville Museum. All three are much alike, representing the Virgin hovering in the clouds supported by cherubs. The ‘Immaculate Conception’ reproduced on the preceding page is one of those in the Prado. Murillo painted many another masterpiece, and

although Saint Anthony and the Immaculate Conception, which he painted again and again, were his favorite subjects, many admire most his beautiful paintings for the Charity Hospital of Seville, among which are ‘Moses Striking the Rock’, ‘St. Elizabeth of Hungary Tending the Sick’, and ‘St. Peter Released from Prison’.

Though Murillo's work at times lacks force and originality, his love of color and sensuous beauty, as well as his pious serenity and charm, have made him one of the best loved of the world's painters.

**MUSCLES.** The muscles are the workmen or the “movers” of the human body, for all movement, conscious or unconscious, is accomplished by them. If we regulate the movement consciously we say the *voluntary* muscles did the work; if we cannot regulate

it of our own free will we say the *involuntary* muscles performed it. Muscle tissues have a peculiar power very highly developed; this is the power of contracting and relaxing like a rubber band.

The largest muscles are those of the arms, legs, shoulders, and back. They are fastened by tendons to the bones and the sort of work they do can be best observed by studying your own arm. The

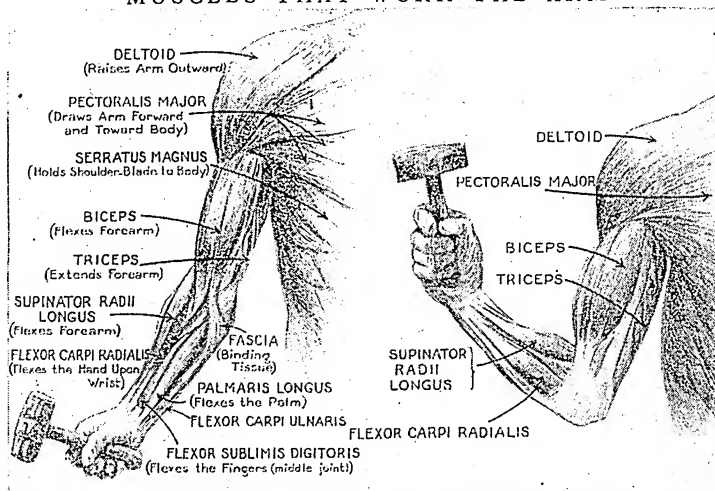
biceps muscle on the front part of the upper arm is fastened by one end to the shoulder; the other end is attached to the main bone of the forearm just below the elbow. Now bend your arm at a right angle, making the muscle rigid. You can feel the hard, thin cord of the tendon right at the crook of the elbow.

At the same time, the top muscle of the forearm runs back to the outside of the upper arm, the two crossing each other over the elbow. You can push the tip of your finger between them at that spot. These muscles are simply using the bones of the arm as rigid levers to do their work.

When the forearm is thrust sharply downward, as in chopping with a hatchet, it is being pulled by the triceps muscle, which runs along the back of the upper arm and around the outside angle of the elbow.

All the muscles which are fastened to the arms and legs are voluntary muscles. They consist of bundles of fibers, each about an inch long and 1/500 of an inch wide. These bundles of fibers are enclosed in elastic

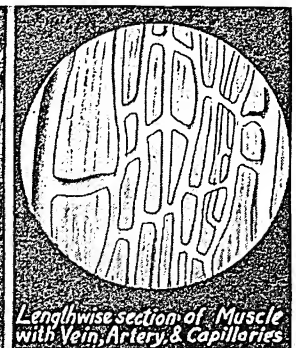
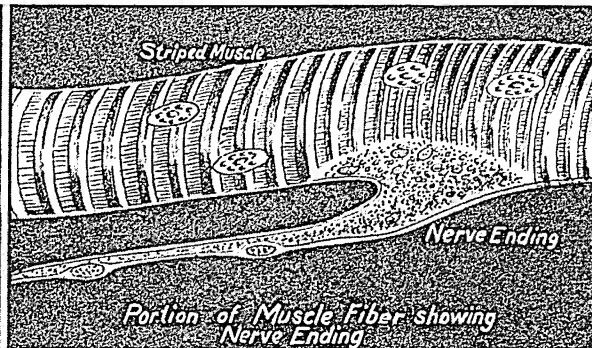
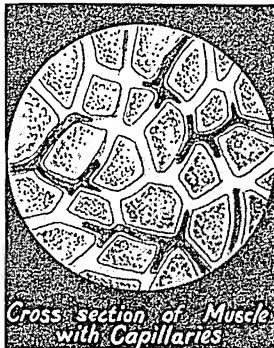
#### MUSCLES THAT WORK THE ARM



See how complicated are the muscles which enable us at one time to wield a heavy hammer and at another time to perform the most delicate tasks with our fingers. This picture will make you realize how important is habit, for if we had to think which of these muscles to use every time we did anything, we wouldn't get much done. But habit gained through long experience enables us to control the muscles instinctively.



## MUSCLES UNDER THE MICROSCOPE



Here we see how muscles are controlled and fed. In the center is a single fiber. Its striped formation enables it to contract or expand whenever the nerve sends in its "orders." At the left is a bundle of fibers, cut across to show how they fit together. The capillary blood vessels contain the blood which nourishes them. The picture to the right shows how the capillaries connect the arteries and veins.

skins which hold them together and protect them. The muscles attached to the ribs of the chest share with the diaphragm muscle the work of expanding and contracting the lungs in breathing (see Diaphragm). These are voluntary muscles, although they continue to work through force of habit, even when we are asleep.

The muscles of the intestines, stomach, heart, and other internal organs cannot be controlled at will. They continue to work whether we wish it or not, and so are true involuntary muscles. (See Heart; Stomach.)

Voluntary muscles are *striated*; they have a cross-striped appearance. Involuntary muscles (except the muscles of the heart) are unstriated or *non-striated*.

There are altogether 500 muscles in the human body. They form the "lean" flesh and constitute fully half of a person's weight. Muscles develop and become strong with use, or get weak and flabby through disuse. Exercises to train the muscles and keep them active is, therefore, the only sure road to health and strength.

A cramp in the arm or leg is due to a sudden and involuntary contraction of a muscle, which is ordinarily under control. This is usually caused by some disorder of the nerves leading from the brain (see Brain). Some diseases like tetanus (lockjaw) and epilepsy produce muscular spasms of this kind.

**MUSES.** Sometimes we say that "we have an inspiration." It seems almost as though some power outside ourselves made it possible for us to think, or speak, or write, or do something better than usual.

The ancient Greeks believed that this inspiration came from the Muses, goddesses who presided over the arts and sciences. So poets and musicians began their important works with a prayer to one or more of the Muses.

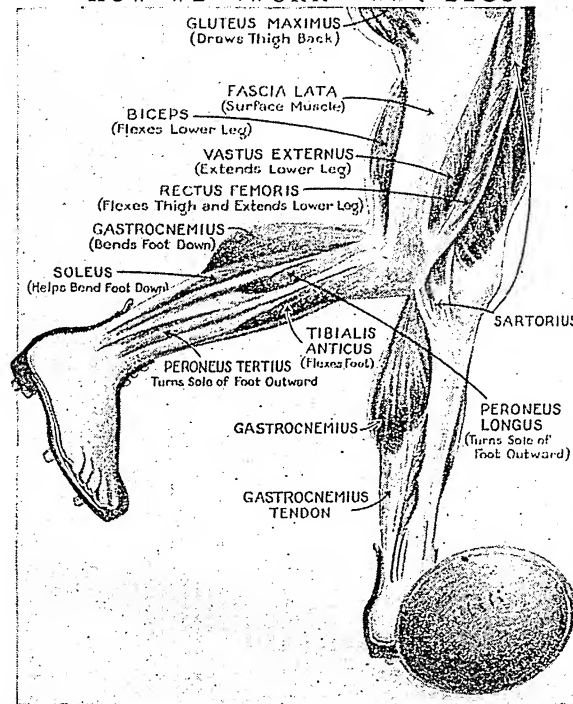
Though the number varies in different accounts, these divinities were generally pictured as nine maidens, the daughters of Zeus, king of the gods, and Mnemosyne (Memory). When the gods gathered in festive assembly on Mount Olympus, the Muses were always present to furnish inspiration and entertainment. Led by Apollo they sang of the origin of the world, of gods and heroes, and celebrated the glorious deeds of Zeus (see Apollo). On earth many places were sacred to them, especially on

Mounts Parnassus and

Helicon. The word "museum" in its Greek form originally meant a temple sacred to the Muses.

Calliope, the most honored of the Muses, presided over epic or heroic poetry. Clio was the Muse of history, Euterpe of lyric poetry, Thalia of comedy and pastoral poetry, Melpomene of tragedy, Terpsichore of choral song and dance, Erato of love poetry, Polyhymnia of hymns, and Urania of astronomy.

## HOW WE "WORK" OUR LEGS



This picture shows most of the muscles that are used in kicking, walking, and running. The "Sartorius" is the familiar "tailor's muscle" which enables us to cross one leg over the other. It is the longest muscle in the body.

## QUEER PLANTS *That Have to STEAL THEIR FOOD*

*The Mysterious Mushrooms and Their Love for Damp, Dark Homes—How Mother Nature Grows Fresh Plants Almost "While You Wait!"*

*—How to Tell the Edible from the Poisonous Varieties*

**M**USHROOMS. In the country perhaps you have seen a fairy ring—a circular patch covered with richer and greener grass than the rest of the meadow, or, it may be, a patch nearly bare of grass. The superstitious folk of Europe used to believe that these were the charmed circles where elves and goblins gathered for their midnight revels. But science has banished the fairies, and along with them went the poetry of the fairy rings. For now we know that these strange patches merely mark the area of certain mushrooms and other fungi, which first use up the nourishment of the soil, and later enrich it by their decay.

But the mushroom itself is scarcely less romantic and interesting than any tale of fairy-lore. What could be more wonderful than a plant that has no root, no stem, no leaves, and which springs up with such rapidity that you can fairly see it grow? Furthermore, mushrooms like other fungi have no green coloring matter (chlorophyll) by means of which most plants manufacture their food, and so they live on the food provided by animals and other plants. And then how varied their shapes and colors—flat and umbrella-like or branching like corals, and delicately tinted with reds and greens and browns!

But perhaps the fact about mushrooms that should most interest us is that while some of them are delicious food, with a flavor all their own, others contain a poison so powerful that to eat it is almost certain death. Hundreds of persons die every year from mistaking the poisonous for the edible varieties of fungi, and at least one royal personage (Czar Alexis of Russia, died 1676) is said to have been among their victims. A Roman writer tells that the Emperor Nero once killed off a whole party of guests at a banquet by feeding them poisonous mushrooms.

### Those Poisonous "Toadstools" are Mushrooms Too

You often hear people refer to poisonous mushrooms as "toadstools," but the botanist does not use that term at all. He calls the higher fungi mushrooms, including the round and umbrella-shaped kinds as well as the large fleshy forms. The common idea that all mushrooms with umbrella-shaped cap are poisonous is not correct. The greater number of our

mushrooms are edible, but we must be very careful when we gather them because it is easy to make a mistake.

Let us see first what mushrooms are and how they grow, and then examine some of the common edible and poisonous varieties. The part of the mushroom plant which rises above the ground is only the fruiting body of the fungus, the rest lying under the ground or rotting log in the form of a mass of dense white tangled threads, called the *mycelium* or *spawn*. These mycelium threads grow from little spores—tiny dustlike particles shed from the full-grown mushroom. Upon

them bud out small whitish knobs of tissue, which push upward, expand, and finally break out in an umbrella shape, or in the characteristic form for each kind of mushroom.

On most mushrooms you will find underneath the umbrella little radiating plate-like gills, set very closely together. It is on these gills that the tiny spores are developed, which drop out, and are carried far and wide by the wind. These develop new plants when they fall upon favorable surfaces.

Most mushrooms delight to grow in moist shady woodlands, or in the bottoms of ravines where there is an abundance of shade and

plenty of warmth and dampness. The common field mushroom and a few others are exceptions to this rule, for they grow best in open grassy meadows, fully exposed to the sun.

Mushrooms spring up with amazing rapidity during warm muggy summer nights, and reach their full growth, shed their spores, and decay in a very short time. They are very delicate plants, as a rule, being easily torn and crushed. They consist chiefly of water, so you can see why most of them cannot bear hot dry winds, or the rays of the summer sun. When a mushroom dies it usually decays into a slimy mass, filled with a multitude of little grubs, or larvae, the young of certain insects which lay their eggs in it.

We are all familiar with the common field mushroom either from seeing it in the fields, or perhaps only in cans or baskets in our markets. It is a rather stocky solid form, white with pinkish brown gills. It grows most abundantly in cow pastures, though it also

### FUNGI DANGER SIGNALS

*The "Destroying Angel" and "Fly Mushroom" and their close relatives belong to the genus Amanita. Four characters distinguish this genus from all others. First, the spores are white. Second, the gills are free from the stem. Third, there is a ring on the stem. Fourth, there is a cuplike structure at the base of the stem called a volva. If you find this combination of characters, your mushroom is an Amanita and extremely dangerous, for, while there are many edible mushrooms with white spores, many with gills free, many with a ring, and many with a volva, there is no other genus that has all four characters in combination. There are some poisonous mushrooms outside the genus Amanita, though none is likely to cause death, and the only safe rule in collecting mushrooms for the table is to collect only those that one knows well enough to call by name.—Prof. W. B. McDougall, University of Southern California.*



Painting by Marshall Smith

See text on following page

### A CONVENTION OF THE MUSHROOMS

The artist has assembled here twelve of the most important members of the mushroom tribe, including one deadly species. They are identified through a key plate on the next page.



## A CONVENTION OF THE MUSHROOMS



KEY TO PRECEDING COLOR PLATE

coralloides (4), Red Clavaria, *Clavaria rufescens* (5), Violet Clavaria, *Clavaria amethystina* (6), Meadow Mushroom, *Agaricus campestris* (7), Parchment Lactarius, *Lactarius pergamenus* (8), Fly Amanita or Fly Mushroom, *Amanita muscaria* (9), Common Morel, *Morchella esculenta* (10), Magpie Mushroom, *Coprinus picaceus* (11), and Yellow Chanterelle, *Cantharellus cibarius* (12).

With the exception of the Amanita, all these are edible, though the Coral Clavaria and the Parchment Lactarius are sometimes slightly poisonous when immature or stale. The best rule to follow with mushrooms, however, is never to attempt to select edible varieties from pictures or verbal descriptions alone. Always get the advice of field experts and have them point out to you the actual growing specimens that are safe.

Many so-called tests for distinguishing poisonous species have found their way into popular tradition and popular literature. None of them is a safe guide, as many people have tragically discovered.

SUCH a convention is possible only on a printed page, for we may be sure that nowhere can we find growing in one spot all the mushrooms shown on the preceding plate.

But this coming together at the magic summons of the painter's brush is a great convenience for purposes of comparison. We can identify the various species through the convenient key-picture at the left.

From top to bottom we see the Shaggy Pholiota, *Pholiota squarrosa* (1), Puff Ball, *Lycoperdon bovista* (2), Dog Mushroom, *Cortinarius caninus* (3), Coral Clavaria, *Clavaria*

does well in cellars. Many people make a business of mushroom raising, especially in Europe where fungi are eaten much more commonly than in this country. Enormous quantities are raised in Paris in underground galleries which extend for many miles at a depth of 60 to 160 feet below the surface.

After the field mushroom, the most common edible forms are the *puffballs*. These are large round whitish knobs, often seen growing along streams and roadways and in open pastures. They are filled with a soft white firm flesh, which turns into a mass of fibers and dark brown spores when the plant is ripe. Who has not stamped on a ripe puffball and watched the clouds of tiny spores rise from it like smoke? All the puffballs are edible when young, but you must be careful to gather them only when they are large, as some poisonous forms of umbrella-like mushrooms pass through a ball-like stage when young. Though all the puffballs are edible, not all are pleasant to the taste. The black puffball, which is hard like a potato and whose flesh is a glistening black, is very bitter, though not harmful.

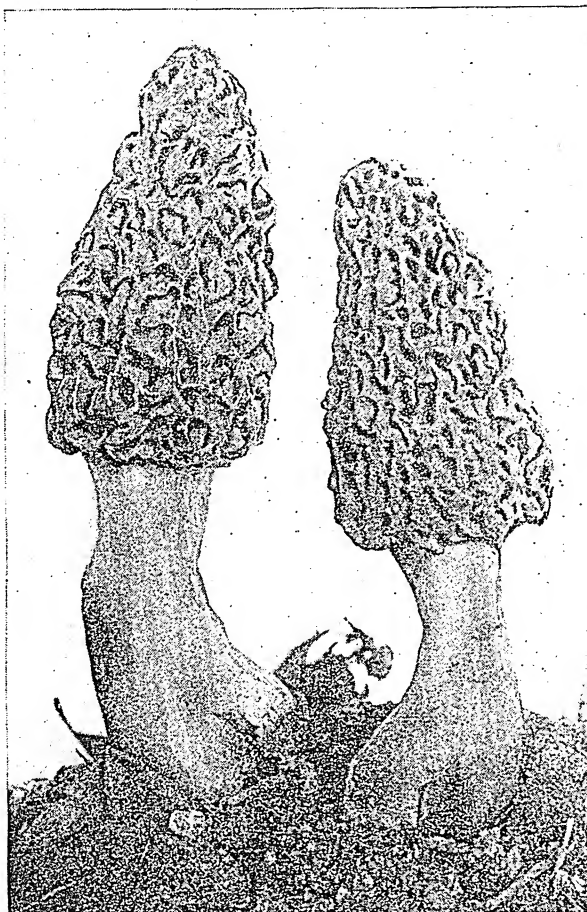
Another group of edible fungi is the *clavarias*, or coral fungi. These grow up in finger-like masses in pretty hues of delicate pink, white, and yellow. The white varieties are the best for food. The *clavarias* grow only in deep, dark, damp woodlands, and wilt very easily when brought out into the sun. They look just like beautiful bunches of coral shining out among the dark forest trees.

The morel, one of our choicest mushrooms and the one used so much in gravies and sauces, is easily recognized by its pale yellow, buff, or light green conical cap, ribbed and pitted like a honeycomb, and set on a stout whitish stem. Another prized mushroom is the chanterelle, distinguishable by the deep rich yellow of its cap, which has an irregular crumpled margin. Its odor suggests ripe apricots or plums. The cap is usually depressed at the center, which gives the name "chanterelle," meaning "little cup."

There are many other kinds of edible mushrooms—such as the edible pore mushroom, variable mushroom, oyster mushroom, horse mushroom, and the liver fungus—but it is not wise to try them for food except on the advice of some experienced person.

Let us turn now to examine some of the poisonous

kinds. Two dangerous species are common in America—the deadly *amanita* and the fly mushroom or fly *amanita*. The former is as beautiful a plant as one could wish to see. It lifts its delicate glistening white umbrella from the forest floor upon a slender graceful stem. But like the beautiful Lorelei in the old German legend, it lures one to destruction. For its beautiful body contains a substance so poisonous that it will cause death in a short time. Hence it is sometimes called the "destroying angel." Its poisonous principle is "phallin," which dissolves the blood corpuscles. The fly *amanita* is not so tall or slender, but it is scarcely less beautiful than its deadly sister. The top of the cap is a brilliant red, flecked all over with tiny white shining scales, like snowflakes, while the rest of the plant is pure white. It gets its name from the fact that its poison, extracted by steeping in milk, was used

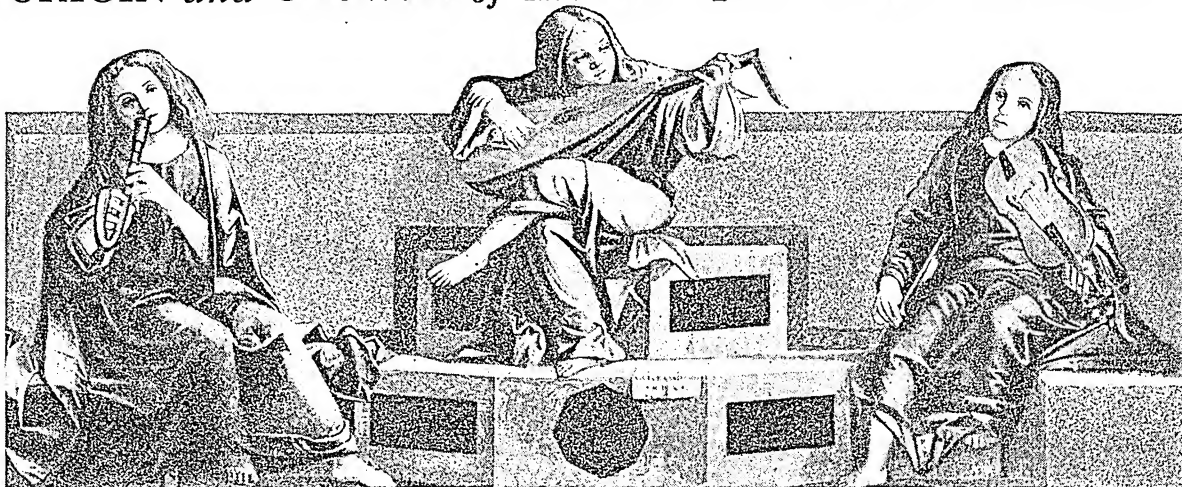


Morels such as these are among the most delicious of the edible fungi. They can be recognized by their pale yellow, buff, or green caps, ribbed and pitted like honeycombs.

to kill flies. The poisonous substance in the fly *amanita* and many other fungi is called "muscarine."

There are several other kinds of poisonous mushrooms. It is a wise rule not to eat any except those of which you are absolutely sure, and these only when they are perfectly fresh. Only one-tenth by weight of a mushroom is food, so it doesn't pay to take the chance of death for the sake of the little nourishment it contains.

Many of our mushrooms belong to the class *Basidiomycetes* (see Fungi), which includes also the rusts and smuts. The common field mushroom, *Agaricus campestris*, is a member of this group. The common morel, *Morchella esculenta*, belongs to the class *Ascomycetes*, and is closely related to the mildews and yeasts. In the same group is the delicious truffle, a tuberlike fungus which in many parts of Europe grows in groups a foot or so below the soil. Dogs and pigs are very fond of truffles and are trained to hunt them by scent.

ORIGIN *and* GROWTH of MUSIC—The “UNIVERSAL ART”

This lovely group of angel musicians sits at the feet of the Madonna in Vittorio Carpaccio's 'The Presentation in the Temple' (1510), now in the Academy of Fine Arts, Venice. The graceful young angel at the left is playing a cromorna, an ancient type of wind instrument. The cross-legged figure in the center is managing a big lute, while the angel at the right is about to sound a note on an early form of the violin. Painting, which was well advanced when music was young, has preserved much musical history.

MUSIC. Some of the oldest fables tell us of the power of music. The ancient Greek hero Orpheus is said to have charmed the very trees and stones with the music of his lyre. So powerfully does it affect the emotions that it was thought to be the product of inspiration. This belief is seen in the origin of our word “music”; for it comes from a Greek word which means “the art of the Muses”—the mythological goddesses of inspiration (*see* Muses). Music more than any other pursuit offers us an opportunity to get away from the ordinary things of life. In proportion as we understand great music, we are lifted out of ourselves into an ideal realm.

If you wish to understand such music as that of Bach, or indeed any great music, you must not try to *explain* it. For it has no “subject”; it is not “about” anything. If music were to attempt to deal with the subject matter of Dickens’ ‘The Tale of Two Cities’, or of Da Vinci’s ‘The Last Supper’, it could only express the emotions roused in the composer by the subjects. But such is the power of music that we get from it what no other art can give us; rather, it deals with those things that are the *basis* of all the other arts. Both Dickens and Leonardo da Vinci were seeking the truth that underlies the exterior of what they portrayed.

The first music was undoubtedly singing—the spontaneous expression of emotion in which speech blended

NOTE: It is recommended that, so far as possible, the musical examples given herein, or referred to, be played or sung by the reader. It would be especially valuable and interesting if a group should try some of the music written for group singing. Simple compositions suitable for that purpose are suggested. Music notation, being merely a symbol of the sounds, means nothing unless the sounds are realized either through the eye and inward ear together (that is, by *looking* at the notation and *hearing* the sounds without actually producing them), or by actual sounds through playing or singing.

with song. The first songs of which we have record are those of savage peoples; they are vivid in rhythm, though monotonous in melody, as illustrated by a primitive Australian song. The song consists of only one short phrase, sung over and over again, to accompany dancing (Fig. 1).



Fig. 1. Primitive Australian Song

Of the three elements of music—rhythm, melody, and harmony—the first to develop was rhythm. It is not only the beginning of music, but also its most important element. When we listen to a march, we feel its rhythm, and we may even try to keep time with hand or foot. This feeling is remarkably developed in uncivilized peoples, who lead an active outdoor life. In parts of Africa, for example, children can beat four with one hand while beating three with the other, and they can move one foot six times while moving the other twice. Some of these complex rhythms are employed in our modern “jazz” music. As music grew, its rhythms made more logical and satisfying patterns, and the melodies became more varied and more beautiful. With this primitive music, rude instruments were doubtless used, especially those of the drum family.

Just as we have our favorite songs today, so in early times members of a group or tribe probably selected from the large number of primitive songs certain ones that they especially liked, and these were handed down from generation to generation. As people became more settled in their habits, and more thoughtful, they made up songs while they worked or played. In course of time, these became less monotonous and took on real beauty. Some of these



## Jewish and Greek Music

used in relation to religion as well as to everyday life. Many of the old hymn tunes originated in much the same way as did the songs of work or play; that is, from a desire for spontaneous expression through a medium more emotional than words alone could be.

The Greeks valued music chiefly from the standpoint of its effect on character; some believed that music apart from words was useless or even harmful. They sang only in unison, or in octaves, and evidently had no knowledge of harmony. For notation they used the letters of the alphabet written above the syllables of the words. The Greeks had a system of scales, each one having a name of its own, as Dorian, Phrygian, etc. You can play some of these on the piano by using only the white keys, beginning successively on A, C, D, E, F, and G.


These natives of the Cameroons in Africa are producing a primitive form of "jazz," by beating drums with their hands while one plays a tune on the marimba—"the African piano"—which consists of wooden slats with resonating gourds.

had, however, as far as we know, no musical notation; the melodies were all memorized, and were sung in unison or in octaves without any harmony.

Christian music bears traces of both Greek and

of both Greek and Jewish influences. From the Greeks it took the system of scales; and from the Jews the chanted music of the Psalms. The priests sang the greater part of the service and the people sang only the hymns. A large number of hymns appeared during the 4th and 5th centuries, but there is no certain record of any hymn tune earlier than the 10th century. In the 4th century, St. Ambrose organized certain scales for use in Christian worship. This work was continued at the end of the 6th century by Pope Gregory; hence we speak of Gregorian chants, which are still much used in religious services.

For many centuries all singing was in unison or in octaves, and it was an important step in advance when two or more independent parts, or "voices," were


  
 Summer is I-CUMEN IN'

This round for four voices is the earliest known piece of harmonized secular vocal music. It was written out—and perhaps composed—about 1240 by John of Fornsete, a monk of Reading Abbey, England.

used at the same time. No one has learned when this began, but we have specimens of part-writing which date as far back as the 9th century. This music sounds strange to us, for it used successions of "fourths," such as C-F (sounded together) followed by D-G, or "fifths," such as C-G followed by D-A; whereas today our ears are accustomed to "thirds," such as C-E followed by D-F. As time went on, part-writing developed. Composers became skilful in combining several parts, each like a thread in a beautiful

organization of singers known as the *eisteddfod*, or congress of bards, dating back long before the Christian era, assumed its present form during the 4th century, and continues to the present day.

The earliest surviving example of secular part-writing, 'Sumer is i-cumen in' (Summer is a-coming in), is believed to have been written about 1240 by an English monk, John of Fornsete. This is called a "canon" or "round," a type of composition in which each part has exactly the same tune, but enters

Fig. 2. From 'Ave, Verum Corpus', by Deprès

pattern. Such music is called "polyphonic" (many-voiced). It involves two elements: counterpoint, which is the art of making each part melodious; and harmony, which is concerned with the beauty and logical progression of the chords.

Church music reached its height with Palestrina (Italian, 1524?-1594). Other great composers of church music in the 15th and 16th centuries were Joannes Okeghem (Netherlands); Josquin Deprès (French); Orlando di Lasso (Netherlands); William Byrd (English); Thomas Morley (English); Michael Praetorius (German); and Thomas Weelkes (English).

This church music carefully avoided marked rhythms, since such rhythms are based on dancing. In the quotation (Fig. 2) from 'Ave, Verum Corpus', by Deprès, you may note not only the absence of a strong rhythm, but also the imitations among the different voice parts, which are indicated by brackets.

#### Development of Early Secular Music

The greatest musicians of those days wrote for the church, but there was also much valuable work in the secular field. The people of every region in Europe had their folk-songs, and during the Middle Ages wandering singers—called *troubadours* in southern France, Italy, and England, *trouvères* in northern France, and *minnesinger* in Germany—roamed from castle to castle singing songs of chivalry and courtly life; while the *jongleurs* delighted the common people. The German musicians organized themselves into guilds (see *Gilds*), and established schools. Competitions were held periodically and the successful candidates were acclaimed *meistersinger*, or master singers (see *Opera: 'Die Meistersinger'*). In Wales, an

separately, delayed perhaps by one measure or two. It also has a definite "ground bass"; that is, a set part or figure, which is repeated all through the piece and is not a real tune in itself. Presently the methods of polyphonic writing developed for church use were employed for secular music in what were called "madrigals." These are part-songs with lively dancing rhythms and emphatically developed individual melodies for each voice.

Along with these new interests in vocal music, instrumental music also made remarkable progress. Every gentleman was supposed to be able to play the lute (a guitar-like instrument), and the favorite instrument for ladies was the virginal, or small harpsichord. Violins were perfected, organs were greatly improved, and several other instruments of the keyboard type came into popular use (see *Musical Instruments; Organ; Piano; Violin*). These were used at first, singly or in combination, to accompany singers. Composers then saw the possibility of using them independently, and began to write for them alone.

The 16th century was a glorious period in music, as it was in geographical discovery, and in literature and the other arts (see *Renaissance*). It brought to perfection the liturgical forms of church music (masses and motets), and as a result of the Reformation it saw a vast enlargement of the popular forms of church music (hymns and chorales), especially in Germany, home of the Reformation. Martin Luther himself wrote both words and music of many hymns and chorales. It was followed by daring experiments in the freer use of harmony, by the further development of musical instruments, the rise of a new kind of music

written for the solo singer, and the beginnings of opera (see Opera). Thus the story of music moves toward its modern period, marked by the great work of Bach and Handel. Just before the dawn of the new period, the English composer Henry Purcell (1658-1695) wrote noteworthy compositions in the polyphonic form for both voices and instruments, that were full of rhythmic life and harmony.

#### Music in the 17th and 18th Centuries

Composers were at work in the 17th and early 18th centuries on musical forms that offered new opportunities for the voice and the instruments. They wrote solo songs (much more elaborate than their forerunners, the folk-songs), part-songs, and operas, and also music for pageants and miracle-plays. Virtuosity in playing musical instruments was notably developed. Among the new instrumental forms created were the *suite*, a group of dance tunes; the *rondo*, which had a theme that recurred in its original key at certain intervals; and the *sonata*, the greatest of all musical forms.

Among the great musicians of the time were Alessandro and Domenico Scarlatti, Corelli, and

The 18th century was distinguished by the genius of some of the greatest masters of the art. Many composers were at work in Germany, notably Johann Sebastian Bach and George Frederick Handel. Technically, Bach's music is polyphonic with free use of

vivid rhythms. He wrote in nearly all forms, both instrumental and vocal, except opera. His music, which reflects religious devotion and feeling, is distinctly a product of the Reformation. The chorale, a religious chorus, is its chief basis, though he sometimes drew his themes from secular

sources. The best example of this is, 'Oh, Sacred Head, Now Wounded', which was originally a love song by Hans Leo Hassler (Fig. 3). Bach used this tune many times in his compositions. An interesting example is found in a chorale at the close of the 'St. Matthew Passion' (Fig. 4).

Chorales serve as the foundation for many of Bach's vocal works, particularly the 'St. Matthew Passion', the 'St. John Passion', and his cantatas. Usually they were merely familiar hymn tunes of the period rewritten in polyphonic style. His greatest choral work is the 'Mass in B minor'. Bach's suites usually

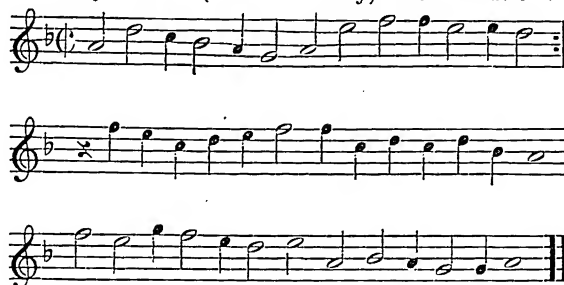


Fig. 3. Melody of Song by Hassler

Fig. 4. Bach's Use of the Hassler Song in the Chorale 'When Life Begins to Fail Me'

Tartini in Italy; and Lully, François Couperin, and Rameau in France. Even more significant than the work of these composers was the gradual adoption of our major and minor scales. As a result, changes from one key to another, called *modulation*, could be made, and great richness in harmony was gained.

contained four distinct dances, almost always in the same key. Among his great songs, 'My Heart Ever Faithful' is one of the most celebrated. His best-known instrumental work, 'The Well-Tempered Clavichord', is a set of preludes and fugues in every key. "Well-tempered" means the system of tuning





Fig. 5. From a Fugue by Bach. Brackets Indicate Entrance of the Four Voices

perfected by Bach, which allows free modulation from one key to another (*see* Piano). Bach perfected the *fugue*, a highly developed canon or round. In this form, the "voices" enter in succession as in a round, but when the first voice has gone through its part, it does not repeat itself, as in a round; rather, it comments, as it were, on what it has already said while the second voice gives out the original theme; and thus the piece continues until all four have entered.

In the first part of Fugue No. 5, Vol. II, 'Well-Tempered Clavichord', as given in Fig. 5, the entrances of the four voices are indicated by brackets. If you study the entire piece, you will observe that there is not a note in it, except for two quick notes in the ninth measure, that does not come from the first two measures. Bach's themes are, for the most part, serious; but they express a wide range of human feeling and never lose their interest, no matter how often you hear them.



Fig. 6. Croatian Folk-Song

because it is simpler and more melodious. He wrote in all the chief forms, especially opera and oratorio.

This period marks an important stage in the development of the *sonata*, the most significant musical form. It is written for a solo instrument or for two instruments, such as the piano and the violin. The corresponding musical form for an orchestra is called

the *symphony*; for a solo instrument accompanied by other instruments it is a *concerto*. Karl Philipp Emanuel Bach, the second and most talented son of J. S. Bach, is an important figure in the development of this form, since he

created for it a first movement, well illustrated in his Piano Sonata in F minor.

The symphony received its greatest impetus from Franz Joseph Haydn. He composed 125 works in this form. A symphony, like a sonata, is written in four parts or movements. The first is fast and arranged in three sections, which may be indicated



Fig. 7. Haydn's Use of the Folk-Song in the 'Austrian Hymn'

Handel is particularly noteworthy for his fund of pure melody, his skill in polyphony, and his capacity for building up great massive choral effects. His work is more easily understood than that of Bach, chiefly

by the letters *a, b, a*. All the themes, or melodies, are introduced in the first, or *a*, part. The next, *b*, contains the development of these themes. Like the plot of a novel, it runs through various keys and is

full of action; *a* again repeats the material of the first part with certain modifications. A second movement usually follows in slow time, like a song, and contains two or three sections. Each has its own theme and all are in a quiet mood. Next comes, as a rule, a lighter movement—a scherzo or a minuet—also in *a, b, a* form. The finale or last movement is often a rapidly moving rondo, with one theme which occurs two or three times with contrasting sections. Thus the symphony deals with great musical masses, each unit of which constitutes a necessary part of the whole design.

Haydn had only a small orchestra at his disposal. It contained flutes, oboes, bassoons, trumpets, horns, trombones, and drums, in addition to the stringed instruments—by that time settled into our present grouping of violins, violas, violoncellos, and double basses. His melodies are always simple and direct. In his work, for the first time, folk-music takes its place frankly as a part of composition. Most of his instrumental music is based on folk-songs and dance tunes. The String Quartet in C major is a fine example of Haydn's chamber music; the slow movement contains the well-known 'Austrian Hymn' based on a Croatian folk-song. A comparison of them reveals the interesting changes that he made in the folk-tune (Figs. 6 and 7).

#### Mozart's Classic Purity

Mozart's is one of the greatest names in all music. He was accustomed to court life, and his music has little of the peasant quality found in that of Haydn. He wrote in all the then known forms of music, but is chiefly famous for his operas ('The Magic Flute', 'Don Giovanni', and 'The Marriage of Figaro'), for

The harpsichord and other early instruments of the piano type could not sustain tone adequately; and in consequence, Mozart and other composers for such instruments ornamented their music with runs, turns, and trills. Chords in the left hand were broken, so that one note would sound after another to maintain the tone. During the century before Haydn and Mozart, the liking for harmonic effects had been steadily growing; yet, even in the music of these two great composers, chords were quite simple and dissonances were few.

#### Beethoven and the Romanticists

Beethoven, who is considered by many to be the greatest of all composers, expanded the sonata, symphony, and kindred forms, and brought music from the courts and cloisters into the realm of common life. His music throbs with human feeling, guided by a noble mind. He wrote in many moods—tragic, tender and playful, humorous and serious. In contrast to those who preceded him, his plan was larger, his themes more vital, and his dissonances sharper (Fig. 8). During Beethoven's lifetime, the Napoleonic Wars were devastating Europe. A great intellectual upheaval was taking place, and this was reflected in Beethoven's work. His music represents another step forward, such as those that occurred successively after Palestrina, after Bach, and after Mozart, when a method of expression had been perfected and a new one had to be found.

Franz Schubert occupies, in the opinion of many persons, the supreme place among creators of beautiful melodies. They have perfection of proportion, clearness, and tunefulness. He wrote over 600 songs, many of which are masterpieces. His time was the

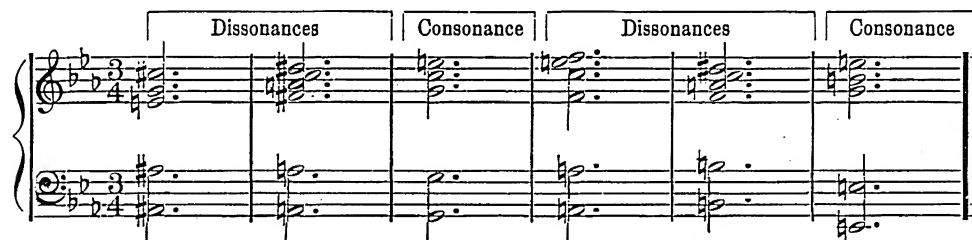


Fig. 8. Chords from the First Movement of Beethoven's Third Symphony

his symphonies, and for his chamber music—compositions for a small number of instruments, of which the string quartet is the best known. His symphonies and string quartets are even more beautiful than those of Haydn. His themes are simple but not rustic, and the greatness of his music lies in its classic purity and skilful use of counterpoint. It is like a finely cut cameo, every line clear, every value perfect. To us, accustomed to more complex music, it may sound too simple, but we should not be deceived. He brought the symphony and kindred forms to such a point of perfection that again the art had to search out new paths, as it did after the time of Palestrina. In Mozart's symphonies the clarinet is used for the first time. He did not use the piano, so far as we know.

beginning of the Romantic Period, when new ideas and new forms were appearing in art and literature. The full flood of romanticism in music did not come until the work of Schumann, but Schubert was of the same world. In addition to his many songs, he wrote symphonies, chamber music, masses, operas, and piano pieces in great numbers. He was limited, however, by the fact that he never mastered the art of counterpoint.

Robert Schumann brought romanticism to full flower. Romantic expression, as we find it in Schumann's music, is marked by a less formal style; in the absence, therefore, of conventional passages; in the clouding of outlines; and above all in the expression of quickly changing moods. He is at his best either

in short compositions or in those where changes of tempo, of theme, and of mood take place constantly. He was not, however, a painter of miniatures; his style is much too free. He is more like an impressionist in painting (*see* Painting).

In Schumann's music, we meet almost for the first time fanciful titles, such as "romance" and "nocturne." In a series of short pieces for his children, he gave each a name as a guide to the mood; for music



Fig. 9. "Siegfried the Youth"

cannot describe; it can only suggest. His charming songs and compositions for the piano represent his highest achievements, though he wrote in almost every musical form.

Felix Mendelssohn, a contemporary of Schumann, was better known, chiefly because his compositions were more easily understood, since they were more straightforward and simple. His work is not as stimulating and suggestive as that of Schumann, yet he composed much beautiful music in all forms. Most famous are the oratorio 'Elijah', the incidental music to Shakespeare's play 'Midsummer Night's Dream' (from which comes the widely popular 'Wedding March'), and his violin concerto.

Frédéric Chopin, who was born in Poland, understood how to write for the piano better than any other composer. He makes it sing like an orchestra, and by the use of the damper pedal spreads out chords so widely that the whole instrument is awakened, as for example in the second part of the 'Funeral March'. He established a new technique in composing for the piano by elaborating melodies with sparkling figures, quick scales, and arpeggios. He was a great virtuoso, and charmed everyone who heard his play-



Fig. 10. "Siegfried the Man"

ing. He was little influenced by other composers, and he did not greatly affect the development of the art.

During this period of glorious instrumental music opera flourished. Following the great compositions of Mozart in this field, came a galaxy of writers, including von Weber, Rossini, Donizetti, Bellini, Mascagni, Verdi, Puccini, and Bizet. (*See* Opera.)

This period is notable also because of Liszt, famous chiefly as a pianist and as a champion of Wagner;

Berlioz, great master of orchestration; and Robert Franz, distinguished for the beauty of his songs.

#### Wagner and the Music Drama

In Germany, Richard Wagner revolutionized the opera, chiefly by making the music answer the demands of the play and by creating *leit-motifs*, or leading themes, expressive of the characteristics of his stage personages, as well as of the underlying emotions of every moment in the play. He has a motif for Wotan, the god, and for Siegfried, the fearless hero, as well as for Mime's fear and Brünnhilde's love. He also made the orchestra into a sort of commentator in the action by giving it themes of its own; for example, themes that reveal what is in the hearts and the minds of the characters. He developed the leit-motifs as the characters developed in the progress of the drama. The motif for young Siegfried before his great adventure

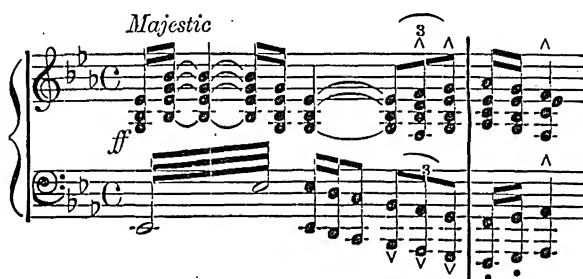


Fig. 11. "Siegfried's Death"

against fate is expressed as in Fig. 9. After he has pierced the flames and won Brünnhilde, the motif changes (Fig. 10). When Siegfried has been slain, the motif is expressed in the form shown in Fig. 11. Of Wagner, it has been well said that he had "the power, which he shares with Bach and Beethoven alone, of coining brief memorable phrases, not formal enough to be called melodies, but so striking and incisive that once heard they cannot be forgotten."

#### The "Three B's"

Johannes Brahms is often referred to, with Bach and Beethoven, as one of the "three B's"—the master composers of all time. In general, he combined romantic expression, such as first appeared fully in Schumann, with classic form. He could manage large musical designs with great skill; indeed, he was the first composer after Beethoven capable of writing a symphony with complete command of all the necessary material. When his four symphonies first appeared, they were considered dry and academic, because people had become accustomed to the glow of the romantic school. Now it is recognized that Brahms' themes are full of beauty and even of sentiment, although it is restrained. Among his finest compositions are the three quartets for piano, viola, and cello. In his series of intermezzi for the piano, the one in E flat minor is thought by many musicians to be the finest short piece for the piano since Bach.

Other contemporaries of Brahms were enriching music by much noteworthy work. Humperdinck,



## A FIFTEENTH-CENTURY ORGAN

assistant to Wagner at Bayreuth, is well known for his opera 'Hänsel and Gretel'. César Franck, organist and teacher for many years in Paris, is at his best in contemplative mood. He wrote a group of masterpieces in the last ten years of his life: a quintet for piano and strings, a violin sonata, a string quartet, a symphony, and a group of beautiful piano compositions.

Among outstanding Russian composers is Peter Ilyitch Tchaikovsky, famous for his six great symphonies, of which the last, the 'Pathétique', is the most famous. He was a soul-sick man, never long happy, although successful and widely known. This condition is expressed in his music, which is never happy, but animated by vigorous and even wild energy, by sentiment, mostly sorrowful, and by occasional tenderness. It has at times great eloquence and fairly sweeps us off our feet by its tumult. His most famous followers were Modest Moussorgsky, whose most popular work is 'Boris Gudenof'; and Nicholas Rimsky-Korsakof, who wrote a charming fairy tale for the orchestra called 'Scheherazade'.

The great Bohemian musical composer and conductor, Antonin Dvorák, is noted chiefly for his 'New World Symphony', composed while he was in New York City. He was of peasant stock, and his music is rich in folk-idiom, as was that of Haydn.

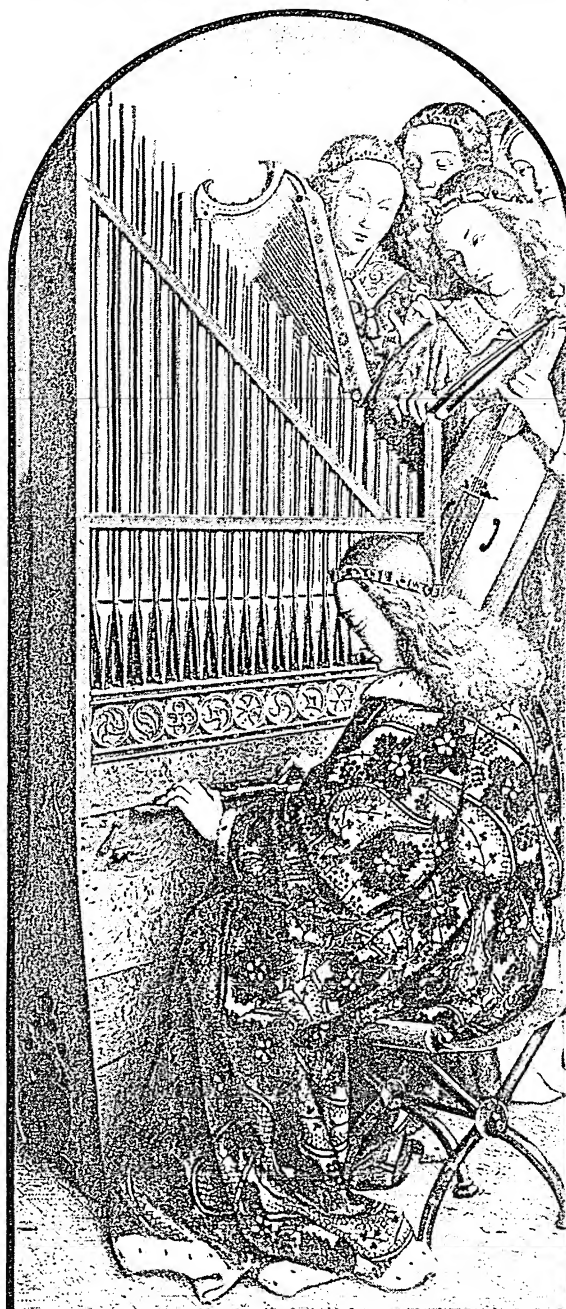
The work of the Norwegian composer, Edvard Grieg is characterized by its distinctly national idiom. His music is in the folk-song style, and is at its best in the short forms, such as the 'Peer Gynt' suites, and in his extraordinarily beautiful songs.

Hugo Wolf, in Austria, carried still further the development of expressiveness in songs. His music succeeds amazingly in setting forth the constant changes of meaning and feeling in the text. In Germany, Richard Strauss gained renown through his operas 'Electra', 'Salome', and 'Der Rosenkavalier', his symphonic poems, and his songs. The symphonic poem is like a condensed symphony all in one movement, and usually suggestive of a particular subject.

French music has always been distinguished for clarity of expression and restraint in sentiment. These qualities may be observed in the work of Claude Debussy. He moves chords with great freedom, and often uses the "whole-tone" scale: C, D, E, F sharp, G sharp, A sharp, B sharp, and D. His melodies are elusive and delicate, and he makes the orchestra sound sometimes like a magical harp, and sometimes like an organ in a great cathedral. His opera 'Pelléas et Mélisande' is famous the world over. Its characters intone a sort of song-speech, which the orchestra illuminates with colorful sound. His most famous piece for the orchestra is 'L'Après-midi d'un Faune'. Maurice Ravel is chiefly known by his ballet 'Daphnis et Chloé', his 'Valse nobles et sentimentales', and his 'Bolero' for orchestra. Saint-Saëns is distin-

guished for his symphonic poems and his operas, of which 'Samson et Delilah' is best known. Charpentier composed the beautiful opera 'Louise'.

Jean Sibelius of Finland has achieved distinction as a symphonic composer. His music reveals the vigor and wildness of his native land. The symphonic poem 'Finlandia' is his best-known orchestral work.



The angels in this famous painting by Hubert and Jan Van Eyck (1420) are playing a "positive" (portable) organ, a harp, and a violin. This is a panel from the Ghent altar-piece, 'The Adoration of the Lamb'.

For some time after Purcell, English music made no marked progress. Sir Charles Hubert Parry and Sir Charles Villiers Stanford began a revival which is still in progress. The comic operas of Sir Arthur S. Sullivan (for which Sir William S. Gilbert wrote the words) are full of tunefulness and interesting humor. Frederick Delius has written distinctively original pieces for orchestra and chorus. Sir Edward Elgar is known chiefly for his 'Enigma Variations' for orchestra, and his oratorio, 'The Dream of Gerontius'. In 'The Hymn of Jesus', a choral, and 'The Planets', an orchestral suite, Gustav Holst has shown a diversified talent. Ralph Vaughan-Williams has revived the English folk-song idiom and written symphonies and many choral works of a high order. Experimenting in new forms, Granville Bantock has produced choral and orchestral works rich in tone and feeling. In his songs and piano compositions, Arnold Bax strikes a note of mysticism.

New ideals and new methods are reflected in the work of many composers of today. Stravinsky, a Russian, is probably the best known. His 'Le Sacre du Printemps' has been widely performed. Malipiero in Italy, Bartok in Hungary, Schönberg in Austria, Scriabine in Russia, and De Falla in Spain, have all contributed to the advance of the art, especially by the free use of dissonances. Some of this new music is difficult to understand and ugly to ears unfamiliar with the new idiom. So, to untrained eyes, are the paintings of ultra-modern artists. We should not condemn a work of art we do not understand, but should either pass it by altogether as not for us or wait patiently for its meaning to be revealed to us by later developments.

#### Music in America

Up to the last few decades, the United States had been too busy felling trees, building homes, and pushing its frontier westward to give much attention to music. The musical interests of the Pilgrims naturally centered about the church. They had brought with them the psalm book used in the reformed churches of England, but they knew only a few tunes, and these they used over and over. Then in 1640 came the 'Bay Psalm Book', the first musical publication in America. 'A Collection of the Best Psalm Tunes', published in 1764, was engraved by Paul Revere.

A number of choral societies and singing schools were organized in the 18th and 19th centuries. The Handel and Haydn Society was formed in 1815, and the Philharmonic Society of Orchestral Players a few years later, both in Boston. The New York Philharmonic, the first professional orchestra in America, gave its first program in 1842. Today the symphony orchestra is one of the cultural assets of most large cities. (See Orchestra.)

Music had its first native expression in the secular song 'My Days Have Been So Wondrous Free' written in 1759 by Francis Hopkinson, a signer of the Declaration of Independence, and a close friend of George Washington. Later, the same composer dedicated a

group of songs to Washington. Little can be said of the secular music of the early 19th century, except that it was overly sentimental and doleful.

Stephen Foster is America's best-known composer. 'Old Folks at Home' and 'Old Black Joe' and other songs of his are widely popular and are like folk-tunes in their simplicity and native quality. John Knowles Paine is undeservedly neglected. His 'Oedipus' and 'Nativity' were the first American compositions in large forms. Edward MacDowell wrote many charming songs, piano pieces, and compositions for chorus and for orchestra.

The "flavor" of America is strongly felt in the music of George W. Chadwick, a thoroughly equipped composer, whose symphonies, string quartets, overtures, songs, and work in other forms are genuine contributions. Henry Gilbert was a self-educated musician who was more independent of foreign influences than were any of his predecessors or followers. Amy Marcy Cheney Beach (Mrs. H. H. A. Beach) wrote excellent music for orchestra and in smaller forms. Ernest Bloch did much distinguished work for the orchestra. Horatio Parker is best known for his oratorio 'Hora Novissima'. Frederick Converse has written more music than any other American composer—symphonies, operas, and smaller pieces—all of which reveal fine craftsmanship. John Powell has composed interesting music for piano and orchestra full of the spirit of the South. John Alden Carpenter brings humor into music in his 'Adventures in a Perambulator' suite, and his 'Sky-Scrapers' ballet is distinctly original and modern. Both Daniel Gregory Mason and Edward B. Hill have won an appreciative public particularly through their symphonies and chamber music. Charles Martin Loeffler has composed much delightful chamber music.

With the exception of Carpenter and Loeffler, all these American composers write in what is called the "conservative tradition." Now there follows a group of younger men reaching out for new ideas and new ways of expression. Chief among these are Charles T. Griffes, whose early death cut short a life of great promise; Howard Hanson, a composer of both choral and orchestral works of real distinction; Leo Sowerby, a competent and original composer; Aaron Copland, whose orchestral pieces are brilliant and forward-looking; and Roger Sessions, a composer of promise.

#### What Is "Jazz"?

To the American negro we are indebted not only for the "spirituals," but for ragtime, which developed into jazz. The spirituals are expressive of profound religious feeling. In ragtime, which relies for its effects mostly on syncopation, we detect the jungle rhythm. Jazz is more than syncopation. It depends for its effect on every kind of musical distortion, especially on the accenting of the odd or unaccented beat and on unconventional chords. Grotesque effects are produced by muted brasses, by use of the saxophone and the clarinet as leading instruments, and by wailing sliding effects. Jazz at its best is like the

best cartoons, at its worst it is below the "comic strip." It is full of a sort of musical slang, racy with the vernacular of cities, and without a breath of fresh air in it. There are no good tunes in jazz but its subtle cross-rhythms are interesting.

The American Indian has made a unique contribution to American music. Indian tunes have vivid rhythms, usually different from those of the drums, which were the principal musical instruments. Often the singers began on a high note and ended almost in a growl. In recent years Indian melodies have been studied by several composers, and some are now known in songs that have gained widespread popularity.

#### Development of Hymn Writing

The singing of hymns was part of the worship of the ancient Greeks and the Jews. The Psalms are the words of Hebrew songs, which seem to have been sung responsively by two great choirs. One choir sang the first line; the other choir answered with the next line, thus:

First choir: The earth is the Lord's and the fullness thereof;

Second choir: The world and they that dwell therein.

First choir: For he hath founded it upon the seas,

Second choir: And established it upon the floods.

And so they continued through the Psalm until the word "selah" occurred; then the singers paused and the instruments played an interlude alone, after which the singing was resumed. This method of "antiphonal" singing is still practised occasionally, and is the forerunner of the present-day singing of hymns by church choirs and congregations. Hymns as we know them today are largely the work of writers since the 16th century. In the 18th century hymnology was enriched by the work of Isaac Watts, Philip Doddridge, Charles Wesley, and many others.

#### Suggestions for Study

*Hebrews and Greeks:* 'Junior High School Song Book', published by E. C. Schirmer Music Company, Boston. A

beautiful Jewish hymn arranged for girls' and boys' voices, p. 353.

*Folk-Songs:* 'A Book of Songs', '140 Folk-Songs', 'The Home and Community Song Book', published by E. C. Schirmer; 'Songs of Many Nations', published by Women's Press, New York; 'Folk-Songs, Chanteys, and Singing Games' by Farnsworth and Sharpe, published by H. W. Gray Co., New York.

*Early Vocal and Instrumental Music:* 'Columbia History of Music for Ear and Eye', Period I, by Percy Scholes. Contains text and phonograph records. An example of the

mixture of polyphony with chords, 'Lo, How a Rose 'ere Blooming' by Praetorius, for girls' voices only in 'A Book of Songs' (see above); also arranged for girls' and boys' voices in 'Junior High School Song Book'. Examples of madrigals: 'The Silver Swan' by Orlando Gibbons, and 'My Bonny Lass' by Morley, arranged for girls', boys', and mixed voices, published by E. C. Schirmer; 'Dido and Aeneas' by Henry Purcell, Oxford University Press, New York.

*From Bach to Beethoven:* Bach albums in 'Master Series for the Young', published by G. Schirmer, Inc., New York; 'The Well-Tempered Clavichord'. The first work contains some of Bach's simpler music. Handel's writing may be studied most advantageously in the Sonata for Violin and Piano in A major, the celebrated 'Largo', a short piano piece 'The Harmonious Blacksmith', his suites, overtures, concertos, and the famous oratorio 'The Messiah'. Volumes of Haydn's pieces for the piano are readily obtainable. The easiest way to get an idea of his music is to play one of his symphonies at the piano, four hands; for example, 'The Clock' in D major. His famous

oratorio is 'The Creation'. A typical song is 'My Mother Bids Me Bind My Hair'. The Sonata for Violin and Piano in G major is suggested for study. The String Quartet in C major is a fine example of his chamber music. An album of easy pieces by Mozart is in 'Master Series for the Young'. The piano sonatas, the String Quartet in C major and the G minor Symphony are typical of his work. These are issued for the phonograph. All the nine symphonies of Beethoven are published for the piano, and are recorded on the phonograph. It would be well to begin with the Fifth, because it is the most direct of them all. The piano sonatas are published in two volumes. There is a Beethoven volume in 'Master Series for the Young'.

*From Beethoven to Wagner:* Schubert's Impromptus and Moments Musicaux for the piano are characteristic of his style. The String Quartet in A minor and the 'Unfinished

LADY PLAYING A LUTE



The lute which this charming Dutch lady is playing with such an intent expression is one of the earliest types of stringed instrument. Large double-necked lutes, like this, had two sets of tuning pegs. The painting, by Terborch (1617-1681), is in the Royal Gallery at Cassel, Germany.



Symphony' are available for the phonograph. To appreciate his music, a helpful plan is to sing some of his famous songs, such as 'Faith in Spring', 'Hedge Rose', 'My Sweet Repose', 'Hark! Hark! the Lark!', and 'Who is Sylvia?' Of Schumann's compositions, the simplest are 'Kinderscenen'. More interesting and not too difficult are 'Nachstücke in F major' and the 'Romance in F sharp minor'. Try also 'The Two Grenadiers', 'Love-Thoughts', 'Thou art like unto a flower', 'By Moonlight', and 'The Lotus Flowers' (these are the English titles for the Schirmer edition). There are phonograph records of the chamber music and many songs. Mendelssohn's easy piano pieces have been collected in album form. The nocturne from 'Midsummer Night's Dream' is beautiful and simple. Much of this work has been recorded, as well as his famous violin concerto. Among Chopin's nocturnes, preludes, and études there are a few comparatively easy to play. Phonograph records have been made of his greater piano compositions.

From Wagner to the Present: Typical selections from Wagner's music may be made from the opera 'Die Meister-

singer'. The prelude to that work is especially recommended. Many scenes from the operas are recorded. Some of César Franck's work may be studied in 'A Book of Songs'. His violin sonata, symphony, quintet, and symphonic variations are recorded. Several melodies of Brahms for unison singing are in 'A Book of Songs'. In the 'Junior High School Song Book' there are nine part-songs. The symphonies, the String Quartet in A minor, the celebrated Quintet for Piano and Strings as well as other works of his are recorded. Several parts of Rimsky-Korsakof's 'Scheherazade' have been recorded for phonograph, as well as 'The Bumble Bee', a short descriptive orchestral piece. Antonin Dvorák's melodious symphony 'The New World', two overtures, some Slavonic dances, and some songs are recorded for the phonograph. Grieg's simple piano compositions and songs have been issued in albums. In addition to these are violin sonatas, symphonic pieces, and many songs. In the album of Debussy's piano music, 'The Girl with the Flaxen Hair' is recommended for study. 'L'Après-midi d'un Faune', and other pieces have been recorded on the phonograph.

## Musical Notation and Theory

SCIENTIFIC analysis tells us that the pleasurable sounds we call music are created by the physical factors of *pitch*, time and accent combined in *rhythm*, and *tone quality* contributed by the overtones of the voices or instruments producing the sounds (see Sound).

To write and read music it is necessary to have a system of symbols—a special musical alphabet, as it were—to indicate pitch, time, and rhythm. As early as the 9th century, certain signs called "neumes" were placed above the syllables of the words to be sung, as memory aids to the singers, but musical notation, as we know it, was not invented until the 11th century, when Guido of Arezzo devised the *sol-fa* method of singing. A certain Latin hymn, the first six lines of which began respectively on the first six tones of the scale, suggested to Guido that if the singers remembered the pitch of the first syllable of each line, they could get any given note from that syllable. These syllables were: *ut, re, mi, fa, sol, la*.

Later *ut* was changed to *do*, and a seventh, or *si*, was added. With a staff to show the relative position of the tones, variously shaped notes were gradually worked out to show length and value of each sound. At first all had black heads, but it soon

became the practise to use outline symbols for the long notes. Two staves were used, one for higher voices and another for lower voices with a note

### LEARNING TO WRITE MUSIC



It took men thousands of years to learn to write music in the simple and intelligible modern fashion. As early as the 9th century of our era musicians had begun to indicate musical sounds by a complicated system of dashes, curves, hooks, and dots, as you see in the example at the top. By the 12th century they had introduced a four-line staff with square notes, thus indicating the intervals between the sounds. From the 15th to the 17th centuries, square and lozenge-shaped notes with or without "tails" to indicate time values were used, with a five-line staff and key signatures, as in the third and fourth examples. From this it was a short step to the present system, with time divisions shown by bars at right angles to the staff.

lowering the pitch indicated by any given note. Such devices are called *chromatic symbols*.

These are the *sharp* (#) indicating the half-tone above the written note, the *flat* (b), marking the half-tone below the one written, the double sharp (x),

for a short cross line (now called middle C) in the position where one line normally would stand between the two staves. This made the remaining notes of the octaves, written up and down, come in different places on their respective staves. Fig. 4 shows this arrangement, with the G, or treble, *clef* (G) used to mark the upper staff, and the F, or bass, *clef* (F) used on the lower one; the clef names are derived from the lines about which the curl starts. Notes above or below these staves are placed on or between short "leger lines" prolonging the staff.

### "Sharps" and "Flats"

The scale resulting from playing all the notes on a staff so constructed is the scale of C major. Since two of the intervals in any scale are half steps or semitones, if one desires to write the scale for any other key there must be some device for raising or

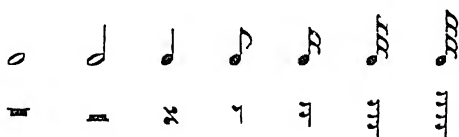
meaning one *whole* tone above, and the double flat (bb), meaning one whole tone below the one written.

To avoid having to use these symbols as long as the key is played, it is customary to place the symbols just before the beginning of the music on the staff. Every note so marked is then to be raised or lowered whenever it occurs. Since certain effects require that this be *not* done, this is indicated by placing a "cancel" mark (q) before a note to show that it has its "natural" or unmarked staff value.

#### Indicating Time, Accent, and Rhythm

We all know how the threefold rhythm of a waltz differs in "feeling" from the fourfold one of a foxtrot, the difference being in *accent*. The feeling of waltz time is established by a strong accent, then two weaker ones. Foxtrot time has a strong accent, a weak one, one intermediate in strength, then a weak one. The respective "accent-patterns," then repeat as long as the rhythm lasts. The word "time" is used in music either to indicate the speed at which successive notes of the accent-pattern are rendered (the *tempo*), or to indicate tempo and the accent-pattern—as when we say "waltz time."

About a century after Guido launched the system of designating pitch by notes on a staff, Franco of Cologne, Philippe de Vitry, and others modified it to indicate these time and accent factors as well. As finally developed, their ideas resulted in placing a line or "bar," across the staff before the strongest accent



The duration of notes and rests is shown by their form. The notes (above) and the rests (below) are, in order: whole, half, quarter, eighth, sixteenth, thirty-second, and sixty-fourth.

of a pattern, thus cutting the staff into horizontal "measures," each containing a complete accent-pattern; and the shapes of the notes within the measure showed how long each was to sound.

Sometimes the composer wants to have a gap, or blank spot, in his march of accents. To make the gap unmistakable, the composer marks it with a rest, of a shape signifying the duration of the gap.

To indicate the accent-pattern intended, a "time-signature" is given at the beginning of the music. The

signature for waltz time, for example, is  $\frac{3}{4}$ . The 3 indicates three accents to the measure, while the 4 in the denominator means that one quarter-note is used for each accent. In foxtrot ( $\frac{4}{4}$ ) time, the numerator 4 indicates four accents to the measure, each one a quarter-note in duration.

#### "Ties" and "Slurs"

Another way used to designate the duration of a note is to place a dot after it, which increases its duration by one-half. Thus, a half-note with a dot lasts three beats—a full measure in waltz time.

A prolonged note sometimes is indicated by writing a second note of the proper value for the prolongation and connecting the two notes by a curved line called a "tie."

If a secondary accent-pattern is "dropped in" upon the march of the main pattern, and the composer wants to call attention to it, he places a curved line called a "slur" above or below it.

#### Melody, Harmony, and Counterpoint

When you sound single notes of varying pitch, duration, and accent one after another, the succession constitutes a *melody*, or tune. Should you sound several different notes at once, you would have a *chord*; and the proper use of chords creates harmony. If we view music written in four-part form vertically, we see it as a succession of chords—that is, in its harmonic aspect. If we view it horizontally, tracing each melody, and its interplay against the others, we see it from the viewpoint of *counterpoint*, which, broadly, is the art of weaving simultaneous melodies together into a pleasing whole.

Experience has developed certain "patterns" or set schemes for developing musical effects in an orderly, pleasing manner. In building a musical form, the composer must work with units, just as an author must put together sentences to make his story. To be pleasing, a musical unit must convey a definite sense of beginning somewhere, going somewhere, getting there, and stopping. One way of doing this is starting it and stopping it on the *tonic*, or fundamental note of the key in which it is played, and reinforcing it at these points with chords also built upon the tonic as their base. In the commonest form of close both bass and soprano sound the tonic of the chord.

(A list of the terms most commonly used in music will be found with the entry Music in the Fact-Index.)

## —REFERENCE-OUTLINE for Organized Study of MUSIC—

OF ALL the arts, music has the most nearly universal appeal. Song and speech must have originated at almost the same stage of human development. From its simplest beginnings in the form of rhythmical utterance or rhythmical sounds made by drumming, it has developed into forms of amazing complexity and has led to the invention of an astonishing number of musical instruments. The study of its development, of its various forms, of the great artists who have contributed to its history, and of the physical basis on which it depends makes up one of the most fascinating chapters in the story of human achievement.

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**MUSICAL INSTRUMENTS.** If you stretch a string or wire tightly and pluck it, the string vibrates and makes a pleasing sound. Or if you close one end of a hollow tube and blow into the other, the air in the tube is set vibrating and makes a different sort of sound. Again, if you strike a thin piece of leather stretched over a box, or a piece of metal suspended by a string, you get another kind of sound caused by the vibration of the leather or the metal.

From these three modes of causing sounds come all the various kinds of musical instruments. When you first look at the piano, the organ, and the many instruments used in bands or orchestras, they seem very different from each other. But a little observation will show you that they all fall into these three great groups or families, according to the way they produce their sounds. Those in which the sound comes from vibrating strings are known as *stringed* instruments; those in which a column of air is set in motion are called *wind* instruments; those which themselves are set vibrating by being struck are called *percussion* instruments.

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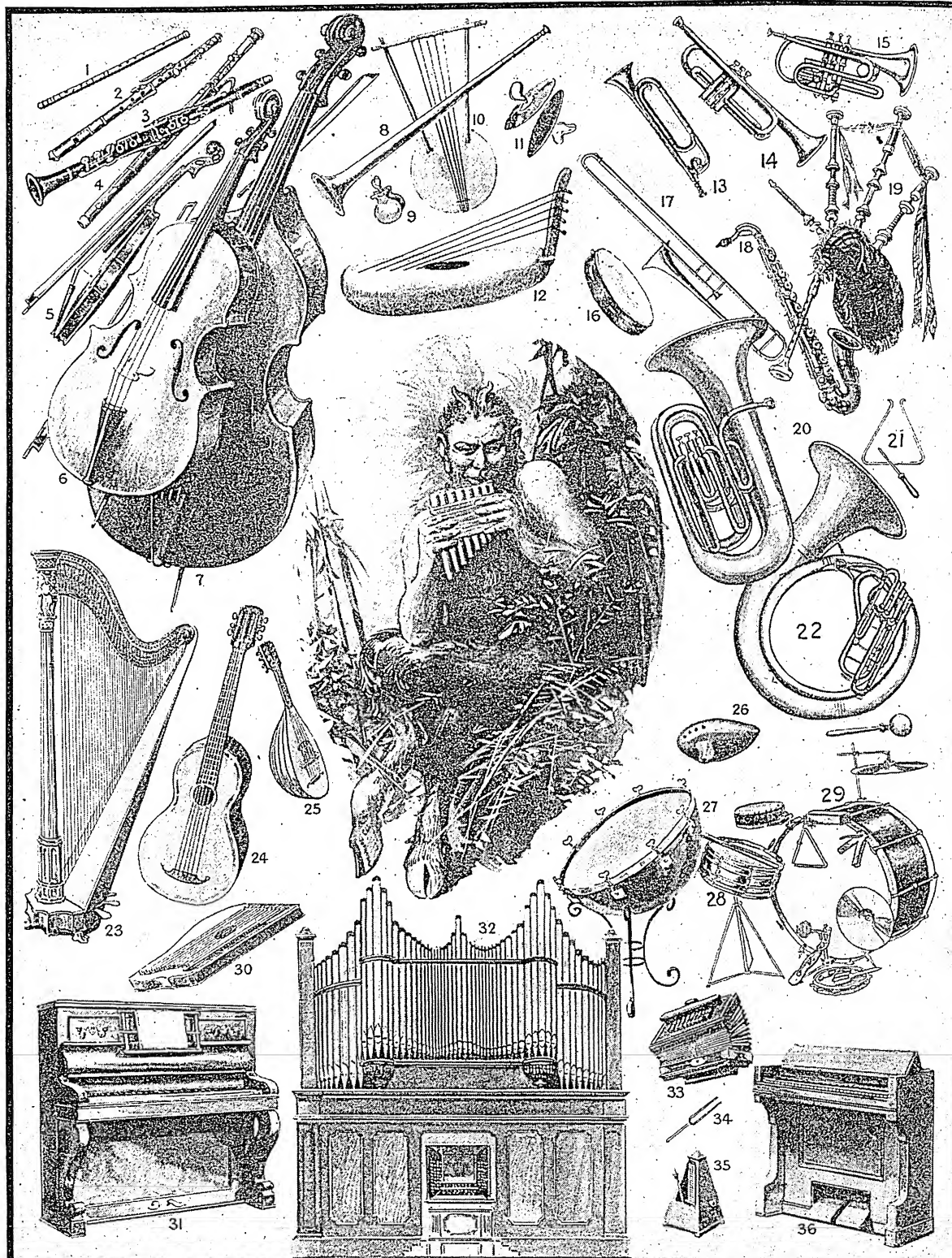
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Of these families the string group is the largest. The piano is its best-known member (*see* Piano). Open the case and you find the strings. They are of wire and are stretched across a great sounding-board of fine strong wood that will not crack or warp. Now, with a quick touch press one of the keys in the center of the keyboard. You will see that you cause a little felt hammer to lift away from the string and at the same time a little metal hammer to strike the string. When this is taking place, you hear a tone. Now take your finger from the key, and you will see the little felt hammer fall back against the string; at once the tone is hushed. This is because the felt pressing against the string stops the vibrations. Sound a key well down toward the left-hand end of the keyboard; the tone you will hear is much lower. This is because the bass strings are so much heavier and longer that they vibrate more slowly.

The harp, with its six and a half octaves, has almost as wide a range as the piano. All the strings except those in the bass are made of catgut; and instead of being struck they are plucked with the fingers. Most

## PAN'S PIPES AND THEIR CHILDREN



When the Greek god Pan invented his rude "Pan's pipes," as the old Greeks fabled, he little thought what a tremendous family of musical instruments would come from them. Here we see a few of their descendants: (1) Fife, (2) Flute, (3) Clarinet, (4) Bassoon (5) Violin, (6) Violoncello, (7) Double Bass, (8) Ancient Trumpet, (9) Castanets, (10) Lyre, (11) Cymbals (early), (12) Ancient Harp (13) Bugle, (14) Modern Trumpet, (15) Cornet, (16) Tambourine, (17) Trombone, (18) Saxophone, (19) Bagpipe, (20) Tuba, (21) Triangle (22) Helicon, (23) Harp, (24) Guitar, (25) Mandolin, (26) Ocarina, (27) Kettle Drum, (28) Snare Drum, (29) Bass Drum and "Traps," (30) Zither, (31) Piano, (32) Pipe Organ, (33) Accordion, (34) Harmonium. The Tuning Fork (34) is used to give true pitch, and the Metronome (35) to mark time.

of the harp tones are thus made without vibrations of any metal, and are therefore much sweeter and richer than the tones of the piano. When you hear a harp you will recall the story about the boy David, who thousands of years ago played upon his harp to soothe the suffering king. For the harp is one of the oldest of all instruments. Read its story, how it has sung its way from a bowstring to an important place in the concert hall. (See Harp.)

Other stringed instruments played much like the harp are the guitar, the mandolin, the banjo, and the zither. (See Banjo; Guitar; Mandolin.)

The violin, another very important member of the string family, is played in a different manner. Instead of being plucked or struck, its strings are usually set vibrating by drawing a horse-hair bow across them, though occasionally harplike effects are obtained from it by plucking. Closely related to the violin are the viola, violoncello, and double bass, which are larger forms of the same type, producing deeper sounds by their greater size. (See Violin.)

The flute, one of the oldest musical instruments, is a typical member of the wind instrument group. This is simply a closed tube in which the air is set in vibration by blowing into a hole in the side or into a mouthpiece in the end of the tube. A smaller form of the flute with a shriller sound is the piccolo. The flageolet and fife also belong to the flute family. (See Wood-Wind Instruments.)

After the invention of the flute, men discovered that they could get different and more varied effects by using a longer tube with a mouthpiece against which their lips could vibrate. Thus originated the wind instruments of the horn and trumpet type. Long tubes are required to produce deep tones, and so in most instruments of this kind the tube is curved into a more or less circular form. In one type, the trombone, the tube is made in two parts, one fitting into the other, so that it can be drawn in or out and thus made shorter or longer. The cornet, the French horn, and the great bass tuba are also members of this group, which is known to musicians as the "brasses." (See Horn, Musical.)

Among the wood-wind instruments and the brasses are some called the "reeds," because they have reeds in their mouthpieces. These reeds are set in vibration by the breath, and they in turn start the air vibrating in the tube, thus producing the sound. Among the common reed instruments are the oboe, English horn, bassoon, clarinet, and saxophone.

Now we come to the percussion instruments, those that themselves vibrate when struck. They are of two chief kinds, drums and bells. Everyone knows the big bass drum and the smaller snare drum, which are so much used in bands to mark the time and to produce stirring martial effects. These drums make indefinite sounds of no fixed pitch, but there is another kind, the kettledrum, which can be tuned to a definite pitch and is much used in orchestras (see Drum). In the bell group are such instruments

as the triangle, the glockenspiel, the xylophone, the celeste, and the cymbals.

The pipe organ and the smaller reed organ are types of wind instruments in which air is supplied by means of bellows. Modern pipe organs have many tones not produced by wind, such as chime and bell effects. Each series of pipes, reeds, bells, or chimes is brought under control of a keyboard. (See Organ.)

In addition to these more important musical instruments, there are a great many minor instruments. Among these are the *accordion*, which is made on the principle of the bellows, the sound being produced by forcing air through metallic reeds; the *concertina*, a 19th-century improvement of the accordion; the *piano accordion*, which has a regular piano keyboard for the right hand and 120 buttons for bass tones; the *bagpipe*, in which the player forces air through three or more pipes by pressure of his arm on a leather wind-bag kept supplied from his lungs; the  *Jew's harp*, a small lyre-shaped instrument, which, placed between the teeth, gives tones from a bent metal tongue struck by the finger; the *harmonica* or *mouth organ* (sometimes called the French harp), in which the notes are produced by the vibration of free metallic reeds; the *ocarina*, a little instrument which has an egg-shaped body, usually of terra cotta, with a mouthpiece and finger holes by means of which soft whistle-like tones are produced.

**MUSK DEER.** From very early times this animal has been hunted for the sweet-smelling "musk" which it yields. It differs from other members of the deer family in having no antlers in either male or female. The male, however, has sharp tusks projecting downward from the upper jaw which are used in fighting. Musk deer inhabit the high plateaus of central Asia, usually living alone, rarely in pairs, and never in herds. They are shy, feeding mainly at night, and on account of the difficulty of approaching them they are usually caught in traps. A full-grown specimen is about 3 feet long and 20 inches high at the shoulders. They vary in color, but are commonly grayish or yellowish-brown, and whitish below. The musk is found in the male only, in a sac the size of a very small orange, situated on the under surface of the abdomen. The sac contains an ounce or more of the crude musk, which when fresh, is said to resemble moist gingerbread in color and consistency. Because of its powerful and enduring odor, this substance is of great value in making perfumery, and is an important article of commerce throughout Asia. Scientific name, *Moschus moschiferus*.

**MUSK OX.** This animal of arctic America, which looks like a small buffalo, wears a dark brown coat of hair, short and curly on the neck and back, but so long on the sides that it almost sweeps the ground. The short tail and small ears of the musk ox are hidden in the long fur.

The great curved horns, whose massive bases meet across the forehead of the adults, make effective weapons against wolves who prey upon the calves. When the wolf pack charges, the bulls and cows form a circle around the calves and, with heads outward, present an impregnable barricade of sharp horns. This strategy is successful against wolves, but against Eskimos and white men hunting with firearms it means sure death to entire herds. An average bull reaches



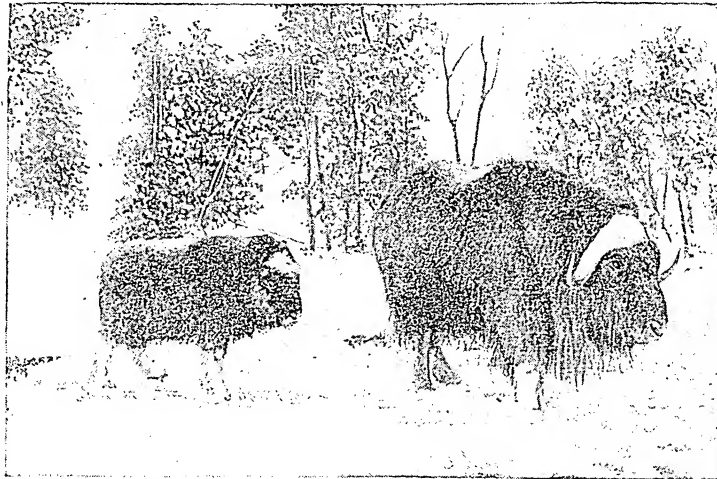
a weight of 450 pounds. The animal gets its name from its peculiar musky odor, which, however, does not appear to be due to the secretion of any particular gland, as in the case of the musk deer. Its cause is not known.

Musk oxen live in herds of 20 or 30 upward and feed on grasses, lichens, moss, willow, and pine shoots. The flesh of some is very palatable, of others tough and unpleasantly musky, especially in old males. They are important food animals to the Eskimos and to Arctic explorers. Scientific name, *Ovibos moschatus*.

**MUSKRAT.** Sometimes when you go skating on a frozen pond in the winter you find a dome-shaped mud-and-grass house, or a little village of a dozen such houses frozen in the ice and covered with snow. If you push a stick carefully through the thick wall, you can hear a soft skurrying inside, then a "plunk, plunk, plunk!" as the muskrats one after another plunge into the water, through a doorway giving access to the water below the ice.

under bushes on the swamp. John Burroughs said the muskrat sometimes seems to be a fine weather prophet. If he begins to build his winter house by

THE MUSK OX AT HOME



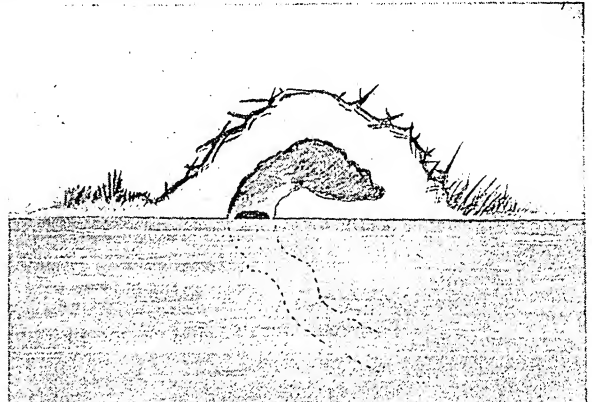
Cold weather does not worry the Musk Ox with his hairy robe. So long as he finds lichens, moss, and willow and pine shoots peeping above the snow he nibbles them and keeps fat and happy.

October — and he works mostly at night—you may be sure there is to be a cold winter. If he builds very high and strong, his house solidly plastered to logs, stumps, or tussocks of grass, look out for high water. "But," said Mr. Burroughs, "I doubt if a long series of observations would bear out the truth of this."

A dark lantern, with which you can throw a light over a

pond, will often give you glimpses of muskrat families feeding at night, but often they may be seen in the daytime nibbling crayfish or water plants along the shore. The adults are about a foot long, heavily built, with scaly and nearly naked tails about nine inches long. The tail is flattened sideways and is used in swimming both as a rudder and as a sort of scull. The partly webbed hind feet serve as paddles. Both males and females have musk glands, the secretion of

THE MUSKRAT AND HIS HOUSE



On the left is one of these busy little creatures hunting about among the bushes on land. The water, however, is his favorite refuge and the element in which he spends much of his time. At the right is a sketch showing how his winter house would look if cut through the middle. Notice its underwater door.

The muskrat doesn't mind. You couldn't wet his sleek, brown fur coat any more than you could wet a duck's feathers. He sleeps only in the daytime, in winter. At night he tumbles out into the icy water and hunts for food. He lives on fresh-water mussels, the tender white calamus blades, and similar food. In summer he burrows in the bank or builds a nest

which causes the musky odor which gives the animal its name. Muskrats raise three or four litters of young every year, averaging from six to eight in each litter. They are naked, blind, and helpless at birth.

The muskrat, also called musquash, belongs to the order of rodents (*see* Rodents). It is found in all parts of North America from the northern limit of

tree growth to the Rio Grande. The dense, glossy, dark brown fur is used both in the natural color and dyed. Seal-dyed muskrat, commonly called by the trade name "Hudson seal," is one of the most popular furs. Scientific name, *Fiber* or *Ondatra zibethicus*.

**MUSSOLINI, BENITO** (born 1883). The spirit of conflict entered the life of Benito Mussolini in his boyhood and followed him through his turbulent career as teacher, manual laborer, editor, soldier, politician, and revolutionary. It brought him, finally, to that day of Oct. 30, 1922, when, at the age of 39, he became dictator of Italy.

His mother was a pious school teacher, his father a poverty-stricken blacksmith of Dovia di Predappio, a village in the Romagna. Benito (named after the Mexican revolutionary Benito Juárez) became a socialist when he was still in his teens. After studying at a normal school, he was a teacher for a short time. An ardent pacifist, he fled to Switzerland in 1902 to escape his term of military service. For preaching socialism he was jailed several times and expelled from one canton to another. He finally returned to Italy in 1904.

For ten years thereafter he worked tirelessly in the cause of socialism, supporting himself by teaching and writing. A gifted author and a brilliant journalist, he wrote a novel, 'The Cardinal's Mistress'; a biography of John Huss; and numerous works of criticism. His newspaper *La Lotta di Classi* (The Class Struggle) won him such fame that in 1912 he was made editor of *Avanti* (Forward!), the official Socialist daily. His abilities as an orator and writer and his compelling personality brought him to the leadership of the Socialist party.

The onset of the first World War ended Mussolini's career as a Socialist. In disagreement with the majority of the Socialists, who demanded strict neutrality, Mussolini advocated Italy's participation on the side of the Allies. He resigned the editorship of *Avanti* and was expelled from the Socialist party. Founding his own newspaper *Il Popolo d'Italia* (The People of Italy), he sounded a vigorous call to arms. In 1916 he enlisted in the army, was wounded, and returned to edit his newspaper.

#### Rise to Dictatorship

During the chaos and confusion which descended upon Italy after the war, Mussolini's power grew rapidly. He alone of Italian leaders offered a simple program which every Italian could understand; he alone promised not more talk but action. Into a private army of Blackshirts he recruited Socialists, veterans, unemployed—all those who, dissatisfied with democratic institutions, were easily swayed by Mussolini's promises of a new, strong Italy. (Mussolini's rise to power and his later career are described in the articles on Fascism and Italy.)

As dictator, Mussolini developed a system of government which placed in his own hands the power to make all decisions. He was *Il Duce* (Italian for "the leader"), and his will was law. Mussolini used his

enormous power to make Italy strong. He built roads, cleared marshes, harnessed the rivers for power, increased production, and reclaimed farm land. He created a powerful Italian army, and used it to build a new Roman Empire. In 1936 he annexed Ethiopia; in 1939, Albania. Indeed he might boast, as he often did, that he had regained for Italy some of the prestige of ancient Rome.

#### In the Shadow of Hitler

The system he designed was destined, however, to turn upon its founder. Italian fascism had provided a working model for Adolf Hitler in the organization of the German Nazi movement (see Dictatorship). Soon Germany proved to be a more efficient laboratory for totalitarian experiments than did Italy, and Mussolini was overshadowed by his imitator.

The test of Mussolini's power came when Italy in 1940 went to war in Germany's wake. His boasted legions made a poor showing against the Greeks and against the British in North Africa, and had to be rescued by German troops. From that time on, Nazi generals dictated Italy's military moves and Nazi officials managed its war economy. In July 1943, while the Allies were advancing through Sicily, the Duce was forced to resign (see World War, Second).

**MUSTARD.** Physicians knew the medicinal value of mustard over 2,000 years ago, and it has been used as a condiment from remote times. Mrs. Clements, of Durham, England, in 1720, is said to have been the first to grind the seeds into flour for table use. Commercial mustard is prepared from two varieties of the mustard plant—one having white seed, the other black. Most of the black seed comes from California and Kentucky. The best grades of white seed are cultivated in England and the Netherlands. The plant will, however, grow almost anywhere. The seeds are very small, weighing from one-fiftieth to three-fiftieths of a grain.

Dry mustard is prepared by cleaning the seeds, extracting their oil in presses, grinding them, and sifting the flour through silk cloth. Usually the two varieties are blended, the black for aroma, the white for pungency. Wet or prepared mustard is made by adding vinegar, salt, and spices to the crushed seeds.

Mustard is a counterirritant, used as a plaster, in liniment, or in foot baths. It is the only stimulating emetic known; that is, taken in warm water, it empties the stomach and at the same time stimulates heart action and respiration, making it valuable in cases of poisoning. White mustard is grown as a salad green, and as a forage crop for sheep. The plant belongs to the genus *Brassica* of the mustard family *Cruciferae* (see Cabbage).

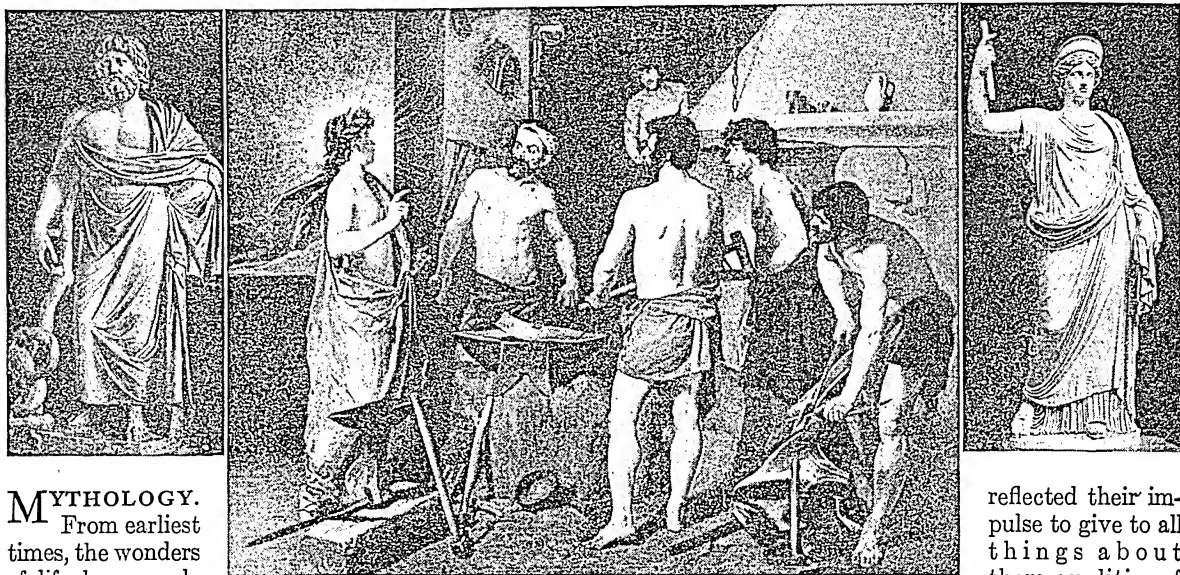
**MYRTLE.** The common myrtle, which among the ancient Greeks was sacred to Aphrodite as the symbol of youth and beauty and was much used in their festivals, is a beautiful evergreen shrub or small tree native to the countries of the Mediterranean. It is not found in the United States except where cultivated, but the name is sometimes improperly applied

to other plants. This classic myrtle (*Myrtus communis*), which grows from 6 to 20 feet high, has glossy leaves and fragrant white or rose-colored flowers, followed by pulpy black berries. Perfumery is made from the aromatic leaves and berries, and in some parts of southern Europe the bark is used in tanning leather. The trailing myrtle, which is common in gardens, cemeteries, and shaded parks, is an evergreen

perennial showing many varieties. It is not a true myrtle but belongs to the periwinkle genus. After its lovely blue flowers have bloomed, they are succeeded by slender many-seeded follicles.

Scientific name of trailing myrtle, *Vinca minor*. Stem creeping, with only short flower stems, ascending; leaves opposite, evergreen, oblong; flowers solitary, growing in the axils of the leaves; salver-shaped corolla, with 5-lobed border; throat angled and thickened; 5 stamens.

## MAN'S FIRST GUESSES *at the* RIDDLE of the UNIVERSE



### MYTHOLOGY.

From earliest times, the wonders of life have made people pause to admire and to question. They eagerly tried to explain and to tell about the mysteries which they saw everywhere around them. Although primitive peoples had neither knowledge nor culture to write of the dawn as did Shakespeare:

But look, the morn, in russet mantle clad,  
Walks o'er the dew of yon high eastward hill. . . .

yet they, we may be sure, were aware of the beauties of its changing colors. Other facts of life, too, aroused wonder and surprise: daytime and evening; birth and sickness and death; springtime and harvest and winter; winds and stars and the moon and the sun.

Since many thousands of years of observation and conjecture passed before scientific thinking resulted in explanations which we today believe to be true, early peoples made up fanciful stories about these marvels. Myths, we call them; and the orderly collection and careful criticism of them is called "mythology."

To the ancient Greeks, the sun was a golden-haired god, Apollo, driving a gleaming chariot across the heavens. His sister was the moon-goddess Artemis, a swift huntress armed with bow and arrow. More powerful than either of these was Zeus, the great god of the heavens, who hurled the thunderbolt and sent the rain. In these and other myths, primitive peoples

The Greeks thought there was a god who presided over each important human activity. At the left is Aesculapius, god of medicine, with his symbol of a serpent entwined about a club. At the right is Hera (Roman Juno), goddess of women and of marriage. In the center is Hephaestus (Vulcan), god of metal-working, as depicted by Velasquez in 'The Forge of Vulcan'. He listens in amazement as Apollo (Mercury) tells of the unfaithfulness of Aphrodite (Venus), Hephaestus' wife.

reflected their impulse to give to all things about them qualities of personality; and thus they imagined mighty gods and heroes ever at

work. They magnified the power of their gods; they idealized their heroes; and they worshiped them with mingled feelings of awe and alarm. Some deities were kind; others were cruel. Some controlled activity in the upper regions—sun, moon, and stars; rain and storm; darkness and light. Others had their sphere of influence on the earth where life and growth were impressive facts—trees and harvest, rivers and mountains. Still others ruled beneath the earth, the place of the dead.

Many myths of peoples far apart are remarkably alike. Myths of the ancient Greeks resemble not only those of India and Egypt but also those of the Norse countries and the American Indians. Although certain basic features are present in the myths of widely separated peoples, yet the character of each race is reflected in its stories. Greek myths reveal joy in life and love of beauty. Norse myths breathe a warlike spirit. Those of the Hindus are full of awe at the mysterious and sublime powers of nature.

Worship of the deities made impressive and involved ritual a necessity so that human beings could put themselves in the right relation with the gods. Thus mythology is not only science in its infancy, but also



religion; and an important part of this fascinating subject is the study of ritual myths for the light which they throw on the development of religions.

The myth-making spirit long held sway over the thinking of mankind, and it may be seen today among children and among uneducated peoples. It is the spirit of fancy and superstition in a world in which anything could happen. In such a world, people could not be sure that two and two would always make four; they would not be surprised if by some curious bit of scene-shifting two and two would really make five! (See Magic.)

So long as people relied on myths to explain the remarkable facts of life on every hand, they had little time or desire to collect facts, to think of them in a calm and connected way, and to discover the laws of which they are parts. While they relied upon the imagination instead of the reasoning, they rejoiced in fairy tales. An important chapter in the story of civilization is the record of victories won by carefully tested methods of the scientific mind over the luxurious imagination of the primitive mind. As painstaking

observers of the wonders of life systematized facts and discovered great universal laws, myths continued to be interesting but not significant except as records of the primitive mind.

To understand our ancestors and other ancient peoples, we must know what they thought as well as what they did. Mythology is thus an important study for history and social sciences because of the light it throws on early thinking. It is likewise a part of literature, for we cannot understand the writings of early peoples without knowing their mythology. Especially is this true of Greek and Roman literature, and—what is most important of all for us—as this literature has had a profound influence upon that of today, so has the old mythology become interwoven with the very fabric of our literature.

Mythology is furthermore a rich treasure house of interesting tales and stories. Because they appeal to young and old and have much that is good and beautiful, they are worthy of careful study. Many of the most interesting myths are told in various places in these volumes.

## —REFERENCE-OUTLINE for Organized Study of MYTHOLOGY—

THE TERM "mythology" applies to the whole body of fascinating stories which arose out of primitive man's efforts to explain the origin of the universe and of man, to solve the mysteries of the world and the facts of life. The term applies also to the scientific collection of myths and legends and their interpretation. Woven out of the fresh imaginations of ancient generations and carried down through ages of popular approval, mythological stories need no justification on the score of interest. But in addition to this reason for their survival, there are many others. A study of the myths helps us, for instance, to understand the early history and customs of the people who originated them. A comparison of the myths of different early peoples often indicates that they had the same origin, and thus sheds light upon prehistoric connections of race and culture. The broad human similarities to be found in the myths of widely separated peoples is of the utmost value to the student of sociology and social psychology. And, finally, an appreciation of many of the finest passages in literature is impossible unless the reader is familiar with the classical myths to which allusions are so frequently made.

### Babylonian and Egyptian Mythology

#### I. BABYLONIAN MYTHS:

- A. Etana, the Shepherd Who Attempted to Fly: B-9.
- B. Adapa, a Fisherman Who Refused Immortality: B-9.
- C. The Great Flood and the Saving of Ut-Napishtim and His Family: B-9-10.

#### II. EGYPTIAN MYTHOLOGY: E-209-10.

- A. Osiris, Legendary King of Egypt and Chief of the Gods: O-252, E-203.
- B. Isis, Wife of Osiris, Queen of the Gods, the Moon-Goddess: I-152. Temple E-211, E-210 picture.

### Greek and Roman Mythology

The mythology of the ancient Romans, a practical people, is based very largely on that of their imaginative and poetical Greek neighbors. Certain native Latin divinities have retained an individuality in Roman litera-

ture, but we find that the chief Roman deities came to be identified with certain Greek gods and goddesses, whose characteristics and adventures they assumed. For this reason we shall consider Greek and Roman mythology together. The Roman names are given in parentheses after the Greek names.

#### I. ANCIENT GREEK THEORY OF THE CREATION:

- A. Origin of Heaven (Uranus) and Earth (Gaea): U-261.
  - a. Their Children, the Cyclops, Hundred-Handers, and Titans: C-418.
  - b. Temporary Power of Kronos and Rhea, and Sovereignty of Zeus (Jupiter or Jove): U-261.
- B. Origin of Man—One of Several Stories Relates How:
  - a. Prometheus Fashioned Man at the Request of the Gods: P-351.
  - b. Pandora Was Created by Zeus to Bring Trouble: P-53, P-54 picture.
  - c. The Great Flood and the Saving of Deucalion and His Wife Pyrrha Were Devised by Zeus: D-58.

II. HEAVEN AND ITS DEITIES: The Heaven of the Greek Gods was a high mountain, Olympus, with a gate of clouds, opened by the Hours or Seasons to permit the passage of the heavenly deities to Earth and to admit them on their return. Each God had a separate dwelling, but at the command of Zeus all repaired to his palace, even those deities who usually dwelt on the Earth or in the Waters or the Underworld. There they feasted on ambrosia and on nectar poured by Hebe, as they discussed the affairs of the Universe or listened to the music of Apollo and the Muses. At the setting of the Sun all returned to their respective dwellings.

#### A. The Greater Gods Who Dwelt on Mount Olympus:

- a. Zeus, Supreme Ruler of the Universe: Z-216, Z-217 picture, S-83 picture.
  - 1. The Olympic Games Which Honored Zeus O-224 and picture.
  - 2. Oracle at Dodona D-43.
  - 3. Temple at Athens A-353.
- b. Hera (Juno), Queen of the Gods: H-281.
- c. Apollo, Son of Zeus and Leto (Latona), God of

- Light and Youth: A-227, A-228 pictures. His Power Through Famous Oracle of Delphi D-43.
- d. Artemis (Diana), Twin Sister of Apollo, Virgin Goddess, Huntress, as Well as Guardian of Wild Beasts, and, Later, the Moon-Goddess: A-310, A-311 picture, E-333 picture. Temple at Ephesus S-83 picture.
  - e. Ares (Mars), Son of Zeus and Hera, God of War: M-70, G-166 picture.
  - f. Hephaestus (Vulcan), Son of Zeus and Hera, God of Fire (Especially Volcanic Eruption, Incendiary Flame, and the Glow of the Forge), and the Blacksmith of the Gods: H-281.
  - g. Aphrodite (Venus), Goddess of Love, Who Sprang Full Grown from the Sea Foam: A-227 and picture.
  - h. Hermes (Mercury), Son of Zeus and Maia, Cunning and Swift-Footed Messenger of Heaven: H-286, S-54 picture.
  - i. Athena (Minerva), Who Sprang Full Grown from the Brow of Zeus, Goddess of Storms, of War, of All the Useful Arts, and Protector of Towns: A-352 and picture. Shrine, the Acropolis A-11 and picture.
  - j. Hestia (Vesta), Sister of Zeus and Eldest Daughter of Kronos and Rhea, Goddess of the Hearth and the Divinity of the Home: V-290 and picture. Temple of Vesta R-146.
- B. The Lesser Deities Who Dwelt on Mount Olympus:
- a. Eros (Cupid), Son of Aphrodite, and God of Love: C-413, C-414 picture.
  - b. Hebe, Daughter of Zeus and Hera, Cup-Bearer of the Gods: H-266.
  - c. Ganymede, a Trojan Boy Who Succeeded Hebe as Cup-Bearer: G-5.
  - d. The Graces, Daughters of Zeus and Hera, Who Presided Over Social Matters. Their Greeting of Aphrodite A-227.
  - e. The Muses, Daughters of Zeus and Mnemosyne, Who Presided Over the Arts and Sciences: M-305, A-228 and picture.
  - f. Themis, a Titan, Daughter of Uranus, Goddess of Justice, Who Sat Beside Zeus on His Throne: (Fact-Index).
  - g. The Fates, Who Controlled Human Destiny: F-17.
  - h. Nemesis, Daughter of Night, Who Represented Righteous Anger and Vengeance of the Gods: N-64.
  - i. Aesculapius, Son of Apollo, Pupil of the Centaur, Chiron, Whose Function Was the Art of Healing: C-131.
  - j. Boreas, Zephyrus, Notus, and Eurus, the Four Winds Who Dwelt with Aeolus, the King of the Winds: A-27.
  - k. Helios, Selene, and Eos (Aurora), Children of the Titan Hyperion: Helios, Charioteer of the Sun was the more ancient Greek Sun-God, frequently identified with his successor Apollo S-82, S-83 picture. Selene was the early Moon-Goddess, whose attributes and adventures were later merged in those of Artemis. Eos was the rosy-fingered Goddess of Dawn, mother of the Stars and of the Morning and Evening Breezes A-365 and picture.
  - l. Phosphor, the Morning Star, and Hesper, the Evening Star, Sometimes Identified with Phosphor.
  - m. Orion, Son of Neptune, Mighty Hunter: O-251.
  - n. Eris (Discors), Goddess of Discord. Her Part in Story of Trojan War T-142.
  - o. Iris, Goddess of the Rainbow: R-46, I-132.
  - p. Nike (Victoria), Goddess of Victory. Temple A-354 picture.

III. THE EARTH AND THE GODS WHO MADE IT THEIR ABODE: The Greeks believed that the Earth was a flat circle in the center of which was either Mount Olympus or Delphi, famous for the Oracle of Apollo. It was crossed from east to west by the Sea (the Mediter-

anean and Euxine or Black Sea), while around it flowed in a steady current the Ocean Stream (personified as the Titan Oceanus), from which the Sea and all rivers received their waters. Beyond the mountains of the North Wind, in a region inaccessible by land or sea, dwelt the Hyperboreans, in bliss and everlasting spring. In the south, close to the Ocean, dwelt the Ethiopians, a people greatly favored by the Gods. On the western margin lay the Elysian Plain, the abode of the blessed H-194. The Dawn, the Sun, the Moon, and most of the Stars rose out of the Ocean to give their light to man.

- A. Chief Gods of the Earth:
- a. Demeter (Ceres), Sister of Zeus, Goddess of Agriculture and of Civilized Life: D-43. 'Return of Persephone' D-44 picture.
  - b. Gaea, or Ge, the Mother Earth, Wife of Uranus: U-261.
  - c. Dionysus (Bacchus), Son of Zeus and Semele, God of Wine and of Animal Life and Vegetation: D-70.
    1. Greek Festival Honoring Dionysus D-91.
    2. Theater of Dionysus at Athens T-74.
- B. Lesser Divinities of the Earth:
- a. Pan, Son of Hermes, God of Flocks and Pastures, of Fields and Forests: P-38.
  - b. The Nymphs: Dryads or Tree Nymphs, Oreads, Nymphs of the Mountains and Grottoes, Napeads, Valley Nymphs N-188.
  - c. The Satyrs (Fauns), Goatlike Deities of Woods and Fields, Attendants of Dionysus: D-70.

IV. THE UNDERWORLD AND ITS GODS: "Beneath the secret places of the Earth" lay a realm of darkness, bounded by awful rivers—the sacred Styx and Acheron, river of woe—where Hades, whose name is given to the region, in a dark and gloomy palace haunted by strange apparitions, ruled the spirits of the dead.

- A. Hades (Pluto), Brother of Zeus, Ruler of the Underworld: H-194.
- B. Persephone (Proserpina), Wife of Hades, and Daughter of Demeter, Goddess of Death and of Spring: D-43, D-44 picture, M-195.
- C. Lesser Divinities:
- a. Aeacus, Rhadamanthus, and Minos, Sons of Zeus and Judges of the Dead. Minos as King of Crete H-282.
  - b. Erinyes, or Eumenides (Furies)—Megaera, Alecto, Tisiphone—Deities Who Attended Persephone and Punished Those Who Had Escaped from or Defied Justice: F-218.
  - c. Hecate, Moon-Goddess: H-268.
  - d. Hypnos (Somnus, Sleep), and Thanatos (Death), Sons of Night: The first brought solace and fair dreams to mortals and the other closed their eyes forever. Dreams dwelt beside Death in an abode with two gates through one of which issued false dreams and through the other those which were true and noble.

V. GODS OF THE WATERS: The Sea had two sets of rulers, the earlier of which flourished during the reign of Kronos. The Titan Oceanus and his sister and queen Tethys, from whom sprang thousands of rivers and numerous ocean nymphs, ruled the waters from their beautiful palace beyond the boundaries of Earth. There was also Pontus (the deep sea), who was the father of Nereus, a genial old man famous for his prophetic gifts and his love of truth and justice. Nereus' wife was Doris, and their children were the fifty fair Nereids.

- A. Poseidon (Neptune), Brother of Zeus, Ruler of the Waters: P-315.
- B. Triton, Son of Poseidon, Trumpeter of Ocean: P-315, (Fact-Index).
- C. Proteus, Little Old Man of the Sea, with Prophetic Powers: P-356.
- D. The Harpies, "The Robbers," the Storm Winds: H-227.

- E. The Graeae, the Three Gray Sisters. In Story of Perseus P-127.
- F. The Gorgons, Three Horrible Sisters. In Story of Perseus P-127.
- G. The Sirens, Sea Muses, Who by Their Singing Lured Mariners to Destruction. Luring of Odysseus O-204-5.
- H. Scylla, Six-Headed Monster, the Destroyer of Mariners. In Adventures of Odysseus O-205.
- I. Atlas, a Titan, Who Supported the Heavens on His Shoulders. In Adventures of Hercules H-282; in Story of Perseus P-128.
- J. The Water Nymphs: Oceanides, Nereids, and Naiads N-188.
- VII. GODS PECULIAR TO ROMAN MYTHOLOGY:**  
Besides the Roman Gods already mentioned, there were certain other deities always peculiar to Roman mythology. Among them the most important were:
- A. Saturn, Who Introduced Agriculture; and Ops, His Wife, Goddess of Sowing and Harvest: S-31. Saturn Gave Name to Saturday D-21.
- B. Janus, God of Doors or Beginnings. Gave Name to January J-183.
- C. Quirinus, a War God—the Deified Romulus: R-146.
- D. Faunus, Grandson of Saturn, God of Fields, of Shepherds, and of Prophecy: P-38.
- E. Flora, Goddess of Flowers: M-91.
- F. Lares and Penates, the Household Gods: V-291.
- G. Fortuna, the Goddess of Fortune: F-161.
- VII. MYTHS OF THE GREATER GODS:**
- A. Myths of Zeus:
- His Love for Io: I-118.
  - Zeus and Callisto, in Story of the Constellations: C-346.
  - Abduction of Europa, in Story of Cadmus: C-11.
  - Punishment of Tantalus: T-9.
- B. Myths of Athena: Her Birth, Helping the Greeks at Troy, Naming of Athens, and Weaving Contest with Arachne A-352 and picture.
- C. Myths of Apollo and Artemis:
- Apollo and the Deadly Python: A-228.
  - Musical Contest Between Marsyas and Apollo: A-228.
  - Hyacinthus and Apollo: H-364.
  - Punishment of Niobe by Apollo and Artemis: N-146.
  - Apollo's Revenge on King Midas: M-158.
  - Love of Apollo for the Nymph Daphne: D-14.
  - Fate of Acteon at Hands of Artemis: A-310.
  - Orion and Artemis: O-251.
- D. Myths of Aphrodite:
- Birth: A-227.
  - Wedding of Aphrodite and Hephaestus: A-227.
  - Aphrodite and Adonis: A-22.
  - Atalanta's Race: A-352, A-351 picture.
  - Hero and Leander: H-287.
- E. Adventures of Hermes: H-286.
- F. Dionysus and the Pirates: D-70.
- G. Abduction of Persephone, Daughter of Demeter: D-43.
- H. Poseidon and the Building of Troy: P-315.
- VIII. MYTHS OF THE LESSER DIVINITIES:**
- Story of Phaethon: P-157.
  - Aesculapius and Chiron: C-130-1.
  - Myth of the Pleiades: P-258.
  - Cupid and Psyche: C-413.
  - Aurora and Tithonus: A-365.
  - Echo and Narcissus: E-143, N-11.
  - Story of the Dryads: N-188.
- IX. MYTHS OF DEMIGODS AND LEGENDARY HEROES:**
- A. The Older Heroes:
- Myths of Perseus: The Doom of King Acrisius, Perseus and Medusa, Perseus and Atlas, Perseus and Andromeda P-127.
  - Myths of Heracles (Hercules): His Youth, His Labors, Further Exploits, Death H-282.
- c. Myths of King Minos of Crete: The Cretan Bull H-282; Daedalus and Icarus D-1.
- d. The Argonauts' Quest of the Golden Fleece: A-281.
- e. Myths of Theseus: Theseus and Ariadne, Theseus and Pirithous and the Battle with the Centaurs T-79, C-130.
- f. Orpheus and Eurydice: O-252 and picture.
- g. Cadmus and the Founding of Thebes: C-11.
- h. Oedipus: O-208.
- i. Castor and Pollux: C-95.
- B. Myths of the Younger Heroes:
- The War Against Thebes: The Sons of Oedipus Battle for the Kingdom O-208.
  - The Trojan War:
    - Origin: Story of Paris P-70; Marriage Feast of Peleus and Thetis and Abduction of Helen, Wife of Menelaus T-142.
    - Greek Heroes Who Took Part: Achilles, Son of Peleus and Thetis, the Bravest of the Warriors A-9; Odysseus, King of Ithaca O-204; Ajax the Great, Second Only to Achilles in Strength and Bravery A-95; Agamemnon, King of Mycenae, Commander-in-Chief of the Greek Forces T-143; Gallant Diomedes, Aged Nestor, the Wise Old Warrior and Counsellor, King of Pylos, and Others.
    - Chief Trojan Leaders: Hector, Son of King Priam, One of the Noblest Figures of Antiquity H-268; Aeneas, Son of Anchises and Aphrodite A-27; Among the Trojans' Allies Were Memnon, King of Ethiopia M-112, the Amazons A-140, and Their Queen Penthesilea (Fact-Index).
    - Story of the War T-142; the Wrath of Achilles A-9; the Shield of Achilles A-8; Battles of Diomedes A-227, A-352; the Amazons A-140; the Death of Hector H-269; Story of the Wooden Horse and the Fall of Troy T-143; the Return of Menelaus to Greece P-356.
  - The Wanderings of Odysseus: The Lotus Eaters O-204; the Cyclops C-418; the Bag of Winds A-27, Odysseus and Circe C-237; the Sirens O-204; Scylla and Charybdis O-205; the Island of Calypso O-205; the Princess Nausicaä O-205-6; Penelope and the Suitors O-206; Return of Odysseus O-207 and picture.
  - Adventures of Aeneas: A-27.

## Norse and Teutonic Mythology

The mythology of the Northmen, who inhabited the countries now known as Sweden, Denmark, Norway, and Iceland, has come down to us chiefly through the Eddas and the Sagas S-36. Although it is distinct from that of the Greeks and Romans, a certain similarity is apparent in many essential features. Cradled in the frozen North, the Scandinavian myths image the spirit of the hardy Viking race, and while their Gods lack the graceful fancy of the Greek deities, they have a rugged personality well calculated to inspire the warlike Northmen to deeds of prowess. The old Germanic peoples accepted the Norse deities as a whole for their own, and their myths are based so largely on the Scandinavian that they have retained little separate identity.

### I. THE GODS AND THEIR MYTHS:

- A. The Creation: Scandinavian myths, like those of the Greeks, tell of the development of the world from darkness and chaos. Originally, there existed a world of mist, a bottomless deep, and a world of light. From the mist-world issued twelve rivers whose frozen waters gradually filled up the bottomless deep. Then from the world of light issued warm winds which melted the ice, producing vapors which rose and formed clouds. From these clouds sprang Ymir, the rime-cold Giant, and his progeny, and a



Cow, Audhumbla, whose milk furnished nourishment to the Giant, and who in turn was nourished by licking the hoar frost and salt from the ice. Finally there appeared first the hair, then the head, and at length the whole form of a god of great beauty and power. This was Bori, from whom and his wife, a daughter of the Giants, sprang Odin, Vili, and Ve. These three slew Ymir, and from his body and blood formed Heaven and Earth. Of his eyebrows they built a fence around Midgard, the destined abode of man. Having created the world they fashioned man from an ashen spar and woman from a piece of elm. To these first human beings Odin gave life and soul, Vili, reason and motion, and Ve, the senses, features, and speech. The universe was supported by Yggdrasil, a mighty ash tree O-202, T-134.

B. Asgard, Abode of the Gods, and Its Chief Deities:

- a. Odin, or Woden, Ruler of the Universe, Who Dwelt in Valhalla, the Hall in Heaven of the Gloriously Slain: O-202, O-203 picture.
- b. Frigga, Odin's Wife Who Knows All Things: S-37.
- c. Story of Balder, Son of Odin, Beautiful God of Sunlight, Happiness, and Spring: B-16.
- d. The Valkyries, Warlike Virgins Who Conveyed Fallen Heroes to Valhalla: S-37.
- e. Thor, "The Thunderer," Eldest Son of Odin: T-82. 'Thor Strives in Vain to Overcome Old Age' T-83 picture.
- f. Bragi, Son of Odin and God of Poetry: S-37.
- g. Iduna, Bragi's Wife, Custodian of the Magic Casket of Apples Which Gave Immortal Youth and Loveliness: S-37 and picture.
- h. Loki, the Mischief-Maker, Who, Though of the Demon Race, Forced Himself into the Company of the Gods: S-37, B-16.

II. MYTHS OF NORSE AND GERMAN HEROES: In the Norse saga of the Volsungs are gathered many ancient legends, with Sigurd, a hero never equaled in comeliness, valor, and great-heartedness, as the central figure. The famous epic 'Nibelungenlied' is the German version of these hero tales, with certain variations of name, character, and incident. Here Sigurd appears as Siegfried.

- A. Story of Siegfried: S-140.
- B. Song of the Nibelungs: N-140. Stories of Wagner's Operas W-1 ('Das Rheingold' O-232; 'Die Walküre' O-232; 'Siegfried' O-233; 'Götterdämmerung' O-233).

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Teeth', 'Circe's Palace', 'The Pomegranate Seeds', 'The Golden Fleece'.

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Nature Myths of Many Lands. By F. V. Farmer. (Amer. Bk. Co., 1910.) Selected from American, Asiatic, and European sources and retold for the younger children.

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# THE EASY REFERENCE FACT-INDEX

GUIDE TO ALL VOLUMES FOR SUBJECTS  
BEGINNING WITH

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TO SAVE TIME

USE THIS INDEX 

EDITOR'S NOTE ON NEXT PAGE TELLS WHY

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## SPECIAL LISTS AND TABLES

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*Numerous other lists and tables in the fields of geography, history, literature, science, mathematics, and other departments of knowledge will be found with their appropriate articles in the main text*

## EDITOR'S NOTE

EVERY user of Compton's Pictured Encyclopedia should form the habit of *first* turning to the Fact-Index section at the end of each volume when in search of specific information. This index is a miniature work of reference in itself and will often give you directly the facts, dates, or definitions you seek. Even when you want full treatment of a subject, you will usually save time by finding in the index the exact page numbers for the desired material.

All page numbers are preceded by a letter of the alphabet, as A-23. The letter indicates the volume. If two or three page numbers are given for the topic you are seeking, the first indicates the more general and important treatment; the second and third point to additional information on other pages. Where necessary, subheadings follow the entry and tell you by guide words or phrases where the various aspects of the subject are treated.

The arrangement of subheadings is alphabetical, except in major historical and biographical entries. In these the chronological order is followed.

The pictures illustrating a specific subject as a rule appear on the same pages as the text to which you are referred. But often illustrations placed elsewhere will prove of additional interest and value. These are indicated by the word *picture* followed by a page number.

A picture reference is frequently intended to call attention to details in the text under the illustration as well as to the illustration itself. This picture-text, therefore, should always be carefully read.

The pronunciations given are those preferred by the best and most recent authorities; alternative pronunciations are indicated only where usage is equally divided. For foreign names the native pronunciation is given except where the English pronunciation has become thoroughly established, as in "Paris," "Barcelona," "Seine."

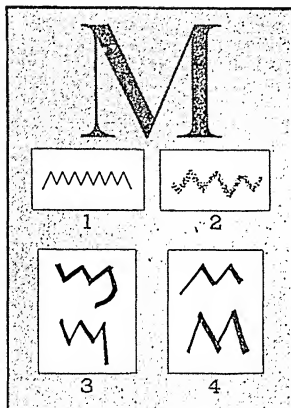
In recent years hundreds of foreign geographical names have been changed, either officially or by custom. Both old and new names are given at the appropriate places in the alphabet.

Populations are given in round numbers, except for places in the United States and Canada, where the figures are those of the latest official census. Distances between points are map or air distances, not distances by railroad.



# THE EASY REFERENCE FACT-INDEX

Reg. U. S. Pat. Off.



OUR LETTER M probably started in Egyptian writing as a wavy or wriggly line which meant 'water' (1). Soon after 2000 B.C., a Semitic people called the Seirites adopted this line as an alphabetic sign for 'm', because their word *maim* for 'water' began with this sound.

The Seirites made the sign about as the Egyptians did (2). The later Canaanite-Phoenician alphabet gave it a tail (3). In Hebrew the sign was called *mem*, and it had similar names in other Semitic languages.

When the Greeks learned to write from the Phoenicians, they gave the letter a symmetrical, balanced shape without a tail (4), and named it *mu*. The Romans took this sign without change into Latin; and from Latin it came into English.

Our small handwritten 'm' is simply a quickly made capital, with curves instead of angles. The printed small 'm' imitates the handwritten one.

NOTE.—For the story of how alphabetic writing began and developed, see the articles Alphabet; Writing.

**Maartens** (*már'túnz*), Maarten, pen name of J. M. W. Schwartz (1858-1915), novelist of Dutch birth; wrote in English, novels picturing Dutch life ('The Sin of Joost Avelingh'; 'God's Fool'; 'The Greater Glory').

**Maas** (*más*), Dutch name for Meuse River. See in *Index* Meuse

**Maastricht** (*más-tríkt'*), or Maestricht, city on Meuse River in extreme s. of Netherlands on Belgian frontier; pop. 60,000; great sandstone quarries, worked since Roman times; beer, brandy, cigars, glass, earthenware: map B-87

**Mab** (*máb*), "Queen Mab," in Celtic and English folklore, a fairy presiding over dreams; mentioned in Shakespeare's 'Romeo and Juliet', Act I, scene iv; gives title to Shelley's 'Queen Mab'; originally a legendary queen Maev of Connaught.

**Mable** (*má'bi*), Hamilton Wright (1846-1916), American editor, critic, and essayist, born Cold Spring, N. Y. ('My Study Fire'; 'Essays in Literary Interpretation').

**Mabinogion** (*máb-i-nó'gi-on*), a collection of ancient Welsh bardic tales, particularly the collection of 12th century knightly romances translated by Lady Charlotte Guest; retold in several versions for young readers: S-303g

**Mabuse** (*má-búsz'*), Jan, name adopted by the Flemish painter Jenni Gosart (died 1532), first of the "Italianized" Flemings.

**Mac**, in Scottish names N-3

**MacAdam** (*mák-ád'am*), or McAdam, John Loudon (1756-1836), Scottish engineer, inventor of macadam roads R-112, 115

**Macadamia**, a tree, *Macadamia ternifolia*, of the protea family; native to Australia but cultivated in Hawaiian Islands, s. California, and s. Florida; first planted in Hawaiian Islands in 1892; average height 30 to 40 ft., trunk about 1 ft. in diameter; leaves dark green; flowers vary in color from white to pink or red. Macadamia nut (also called Queensland nut) has hard shell and is about 1 inch in diameter. Kernel, solid and white, is edible and yields oil used in soap and in medicine.

Macadam roads R-115

**McAdoo** (*mák'-á-dó*), William Gibbs

(1863-1941), American lawyer and financier, born near Marietta, Ga.; secretary of treasury under Wilson; directed building of Hudson tunnels 1902-09; director general of railroads 1917-19; U. S. senator from California 1933-39.

**McAfee**, Cleland Boyd (born 1866), American clergyman and author, born Ashley, Mo.; professor systematic theology, McCormick Theological Seminary, Chicago, Ill.; moderator of general assembly of Presbyterian Churches of U. S. 1929-30; afterward secretary Presbyterian Board Foreign Missions.

**McAfee**, Mildred H. (born 1900), educator, born Parkville, Mo.; president Wellesley College after 1936; made head of "Waves" (Women's Naval Reserve) with rank of lieutenant commander Aug. 1942; promoted to captain Nov. 1943.

**McAlister**, Okla., a railroad and shipping city 66 mi. s.w. of Muskogee; pop. 12,401; center of coal fields and rich farm region: map O-216

**Macalester College**, at St. Paul, Minn.; Presbyterian; founded 1885; arts, sciences, music.

**McAllen**, Tex., city in extreme s., 52 mi. n.w. of Brownsville; pop. 11,877; canning and oil industries.

**McAlister**, Ward (1830?-95), American society leader, remembered as originator of the phrase "the 400" for "smart" New York society; phrase said to have originated because if list were larger, the Astor ballroom could not accommodate the "eligible" guests.

**MacAlpine**, Kenneth. See in *Index* Kenneth I. MacAlpine

**Macao** (*má-ká-ó*), or Macau, China, Portuguese settlement and seaport on Macao Island at mouth of Canton River 40 mi. w. of Hong Kong; settlement forms with neighboring islets the Portuguese colony of Macao; total area, about 8 sq. mi.; pop. 170,000; Camoens here finished the 'Lusiad': C-221j, map C-212

**Macaque** (*má-kák'*), or bonnet monkey M-230, picture M-229 hand, picture A-225

**Macaroni** (*mák-á-ró'ní*), a dandy Y-204

**Macaroni**, wheat flour paste dried in form of tubes M-1

**MacArthur**, Arthur (1845-1912), American general, born Springfield, Mass.; service in Civil and Spanish-American wars; military governor of Philippines 1900-01.

**MacArthur**, Douglas (born 1880), American army officer M-1-2

**McArthur**, Peter (1866-1924), Canadian author; for about 18 years a journalist in New York; returned to birthplace and wrote independently ('In Pastures Green', 'Around Home', 'Friendly Acres').

**Macassar** (*má-kás'ár*), seaport and capital of Celebes, Netherlands Indies, on w. coast of s. peninsula of island; pop. 87,000; source of macassar oil, from seeds of the kusam tree (*Schleichera trifuga*), so widely used as hair ointment in 19th century that tidies to protect chair backs were called "anti-macassars": map E-142

**Macassar**, Strait of, a channel separating islands of Borneo and Celebes, uniting Java Sea and Celebes Sea, and making a celebrated biological division: map E-142. See in *Index* Wallace's Line

**Macaulay**, Rose, contemporary English author of novels, verse, essays; writes with humorous, satirical touch ('Potterism'; 'Dangerous Ages'; 'Told by an Idiot'; 'Orphan Island'; 'Crewe Train'; 'Personal Pleasures'; 'John Milton'; 'And No Man's Wit').

**Macaulay**, Thomas Babington, Baron (1800-59), English essayist and historian M-2-3 charges against Hastings H-234 essays E-304

great talker C-347a quoted: on Gladstone G-98; on Reformation R-67; on Shakespeare S-100c story of Horatius at the Bridge T-88-9

**McAuley**, Catherine (1787-1841), Irish philanthropist, founder of the Catholic order of Sisters of Mercy.

**Macaws'**, South American parrots M-3, P-82, color plate P-83-4

**Macayó**, Brazil. See in *Index* Macaio

**Macbeth'** (died 1057), usurping king of Scotland, hero of Shakespeare's tragedy 'Macbeth' M-3 chronology and rank of tragedy S-100e

**McBurney**, Charles (1845-1913), American surgeon, discoverer of "McBurney's point" (spot on abdomen where pressure reveals appendicitis), and pioneer in aseptic technique.

**Maccabees** (*mák'-á-béz*), distinguished Jewish family dominant in Jerusalem in 2d century B.C., descend-

- ants of the brave priest Mattathias; chief member Judas (died 160 B.C.); story told in apocryphal Books of Maccabees  
led revolt against Syria J-217  
sacred standard F-84
- Maccabees, fraternal society, organized 1878, London, Ontario, Canada; reorganized 1883; in 1926 Ladies of the Maccabees was merged with men's organization; local lodges called Tents (men), Hives (women), and Courts (juniors); has homes for aged at Alma, Mich., and Chatham, Pa.
- McCartan, Edward (born 1878), sculptor, born Albany, N. Y.; noted for well-designed figures and figure groups, 'Eugene Field Memorial' at Chicago, and 'Diana' in Metropolitan Museum, New York City.
- McCarthy, Charles (1873-1921), American librarian and lecturer, born Brockton, Mass. W-125
- McCarthy, Cormac, builder of Blarney Castle, picture I-127
- McCarthy, Denis Aloysius (1870-1931), American poet and journalist, born Ireland, came to U. S. when 15; poetry musical and much of it patriotic; wrote 'The Sowers' for Boston celebration of 150th anniversary of American Revolution ('Songs of Sunrise'; 'The Harp of Life').
- McCarthy, Justin (1830-1912), Irish historian, author, and Nationalist leader of the more temperate kind; in parliament 1879-1900; but his chief interest was in literature ('Miss Misanthrope', novel; 'History of Our Own Times', story of reign of Queen Victoria; 'History of the Four Georges'). His son, Justin Huntly McCarthy (1860-1936), is also known as a novelist and historian, but still better as poet and dramatist ('If I Were King').
- McCarver, Morton Matthew, pioneer in western U.S.; staked out tracts of land and sold them; went to Washington from Oregon 1868: T-1
- McChord Field, U. S. Army air base T-1
- McClellan, George Brinton (1826-85), American general M-3, C-253, 254, picture L-143  
Antietam A-221  
presidential candidate M-3  
Seven Days' battles M-3
- McClintic, Guthrie (born 1893), theatrical producer and director, born Seattle, Wash.; imaginative and original; directed many plays for his wife, Katharine Cornell, including 'The Green Hat' and 'The Barretts of Wimpole Street'.
- McClintock, Sir Francis Leopold (1819-1907), British admiral and Arctic explorer who led 4 expeditions in search of Sir John Franklin's expedition.
- McCloskey, John, Cardinal (1810-85), Roman Catholic prelate, born Brooklyn, N. Y.; bishop of N. Y.; first American cardinal.
- McClure, Sir Robert John LeMesurier (1807-73), Irish admiral and Arctic explorer; discoverer of Northwest Passage P-280  
route, map A-143
- McClure, Samuel Sidney (born 1857), American editor and publisher, born Ireland; was graduated Knox College; established the McClure Syndicate 1884, first newspaper syndicate in U. S.; founded *McClure's Magazine* 1893; "discoverer" of many of the members of its brilliant staff of writers; has traveled in foreign countries making studies of national conditions ('My Autobiography').
- McClurg, James (1747-1825), American physician and statesman, born Hampton, Va.; member Constitutional Convention.
- McCollum, Elmer Verner (born 1879), American biochemist; born Fort Scott, Kan.; authority on relation of diet to growth and disease; identified vitamin A and other vitamins; professor University of Wisconsin and Johns Hopkins University  
work with vitamins V-311b, 312
- McComb, Miss., city in farming and dairying section 62 mi. s.e. of Natchez; pop. 9898; rayon and cotton products; railroad shops: map M-200
- McConnell, Francis J. (born 1871), American Methodist bishop, born Trinway, O.; president De Pauw University, 1909-12; served as bishop number of years in Mexico and Pittsburgh dioceses; elected president Federal Council of Churches, 1928 ('Personal Christianity', 'Living Together').
- McCormack, John (born 1884), American tenor, born Athlone, Ireland; London debut 1907 in 'Cavalleria Rusticana'; New York debut 1909 in 'Traviata'; many successful rôles in opera; most famous as a concert singer.
- McCormick, Cyrus Hall (1809-84), inventor of harvesting machinery M-3-4, pictures M-4, I-115  
reaper invented A-49
- McCormick, (Joseph) Medill (1877-1925), American newspaper publisher and Progressive leader, born Chicago, publisher Chicago *Tribune*; U.S. senator 1919-25.
- McCosh, James (1811-94), Scottish-American philosopher and educator, born Ayrshire, Scotland; had won distinction as a preacher and as professor of logic and metaphysics, Queens University, Belfast, before he was called to America 1868 as president Princeton College ('Method of Divine Government, Physical and Moral').
- MacCracken, Henry Noble (born 1880), American educator, born Toledo, Ohio; president Vassar College since 1915; authority on Shakespeare and Chaucer; author of texts in English composition.
- McCrae (mă-kra'), John (1872-1918), Canadian physician, soldier, poet; served in Boer War and 1st World War; author of 'In Flanders Fields': C-66
- McCulloch, Hugh (1808-95), American financier, born Kennebunk, Me.; comptroller of the currency 1863-65 and secretary of the treasury 1865-69 and 1884-85.
- 'McCulloch vs. Maryland', case in U. S. constitutional law M-71, U-212
- MacCullough (mă-kul'ō), John Edward (1837-85), American tragedian, born Ireland; acted with Booth and Forrest.
- McCutcheon, George Barr (1866-1928), American novelist, born near Lafayette, Ind.; brother of John T. McCutcheon ('Graustark'; 'Brewster's Millions').
- McCutcheon, John Tinney (born 1870), American cartoonist and war correspondent, born near Lafayette, Ind.; on staff Chicago *Tribune* since 1903  
president Chicago Zoölogical Society Z-225
- MacDill Field, U.S. Army Air Corps field, 7 mi. s.w. of Tampa, Fla.
- Macdonald, Flora (1722-90), Scottish Jacobite heroine P-345
- Macdonald, George (1824-1905), Scottish novelist and poet; studied for ministry and preached for a time; wrote chiefly of Scotland and Scottish people ('David Elginbrod'; 'Robert Falconer', novels; 'At the Back of the North Wind'; 'The Princess and the Goblin', children's stories).
- Macdonald, James Alexander (1862-1923), Canadian Presbyterian clergyman and editor; pastor Knox Church, St. Thomas, Ontario, 1891-96; in 1896 founded *Westminster*, a religious journal; editor Toronto *Globe* 1902-16 ('Democracy and the Nations').
- MacDonald, James Ramsay (1866-1937), English statesman, first Labor prime minister of England M-4, E-276, 276a  
Fabian Society S-181  
Stanley Baldwin and B-17
- MacDonald, Jeanette (born 1907), actress and singer; popular in musical films ('Naughty Marietta'; 'San Francisco'; 'The Firefly'; 'Broadway Serenade').
- Macdonald, Sir John Alexander (1815-91), Canadian statesman, first premier of Dominion M-4-5, C-60, 62
- Macdonald, John Sandfield (1812-72), Canadian statesman; premier of Canada 1862-64; first premier of Ontario 1867-71; independent of party lines.
- MacDonald, Malcolm (born 1901), statesman born Lossiemouth, Scotland; son of Ramsay MacDonald; dominions secretary 1935-39; minister of health 1939-41; appointed high commissioner to Canada 1941.
- MacDonald, Wilson (born 1880), Canadian poet; wrote melodious lyrics and nature poems ('A Song of the Prairie Land'; 'The Miracle Songs of Jesus'; 'Out of the Wilderness').
- Macdonald College, at Ste. Anne de Bellevue, Quebec, Canada; non-sectarian; founded 1907; agriculture, household science, teachers' training; an incorporated college of McGill University.
- MacDonald Observatory, on Mount Locke, near Ft. Davis, Tex.; completed 1939; joint enterprise of universities of Chicago and Texas and affiliated with Yerkes Observatory.
- Macdonald of Garth, John (1774?-1860), Canadian fur trader, born Scotland; joined North-West Company 1791; served in western Canada and in 1813 received surrender of Fort Astoria.
- Macdonell, Alexander (1760-1840) Canadian Roman Catholic prelate, born Glengarry, Scotland; emigrated to Canada with his kinsmen and formed a colony called Glengarry; made first bishop of Kingston, Ont., 1826.
- Macdonough, Thomas (1786-1825), American commodore in War of 1812; often called the "hero of Lake Champlain": W-10
- McDougall, John Lorn (1838-1909), Canadian statesman, born Renfrew, Upper Canada; member Canadian House of Commons 1869-72, 1874-78; auditor general 1878-1905.
- McDougall, William (1822-1905), Canadian statesman and one of the Fathers of Confederation, born York, Upper Canada; leader of the reform party.

Key—cäpe, ät, fär, fäst, whät, fäll; mä, yät, fêrn, thêre; äce, bît; rōw, wón, fôr, nôt, dg; cäre, büt, rüde, füll, bärn;

McDougall, William (1871-1938), Anglo-American psychologist, born England; professor psychology, Harvard University 1920-27, at Duke University after 1927; held that life is not merely response to stimuli but is purposeful striving ('An Introduction to Social Psychology'; 'Body and Mind'; 'Energies of Men').

MacDowell, Edward A. (1861-1908), American composer, born New York City M-5, M-316

MacDowell, Ephraim (1771-1830), American surgeon, born Rockbridge, Va.; practised Danville, Ky.; performed first ovariectomy recorded in U.S. in 1809.

MacDowell, Irvin (1818-85), Civil War general, born Columbus, Ohio C-253 defeat at Bull Run B-271

MacDowell, Marian Nevins (Mrs. Edward A. MacDowell), American pianist, born New York City MacDowell Colony M-5

MacDowell, Mary E. (1854-1936), American social worker, born Cincinnati, O.; director and head University of Chicago Settlement, in stockyards district after 1893; executive Chicago branch National Association for Advancement of Colored People; director Chicago Immigrants' Protective League.

MacDowell, Patrick (1799-1870), British sculptor; distinguished for his statues of William Pitt, the Earl of Chatham; a leading representative of the classic school.

MacDowell, William Fraser (1858-1937), American Methodist bishop, born Millersburg, Ohio; held pastorates in Ohio; chancellor of University of Denver 1890-99; elected bishop 1904 ('A Man's Religion').

MacDowell Colony M-5

Mace, originally a weapon of offence; later a staff carried into battle by medieval bishops; now a symbol of ecclesiastical or civil authority, as in English House of Commons.

Mace, a spice N-187

Macedonia (*mās-ā-dō'nī-ā*), a region of s.e. Europe, once seat of empire under Alexander the Great; most of it ceded to Greece by Turkey 1913; pop. between 2,000,000 and 3,000,000: M-5, maps G-154, B-18 divided after 1st World War B-17 rise of empire A-113-15, G-161 Roman conquest G-161 Saloniki S-14-15

Maceió (*mā-sā-yo'*), or Magayó, Brazil, important port and capital of state of Alagoas on Atlantic coast; about 125 mi. s.w. of Recife; pop. 135,000: map B-226

McElroy, Mary Arthur (1842-1917), sister of President Chester A. Arthur and his White House hostess; revived pre-Civil War traditions of hospitality: W-92

Maceo, Antonio (1848-96), Cuban patriot, born Santiago de Cuba; one of leaders of the first Cuban insurrection in 1866; killed in battle of Punta Brava: L-67g

Maceration, in perfume-making P-125

McEwen, Walter (1860-1943), American landscape, mural, figure, and portrait painter, born Chicago.

McFee, William (born 1881), Anglo-American novelist, writer of sea stories, born on his father's square-rigger; went to sea (1905) as engineer and did much of his writing at sea; came to U. S. 1911; in Mediterranean with British Navy during most of 1st World War ('Casuals of the Sea'; 'Captain

Macedoine's Daughter'; 'Life of Sir Martin Frobisher'; 'North of Suez'; 'The Harbourmaster'; 'The Beachcomber'; 'Derelicts').

MacGahan, Januarius Aloysius (1844-78), American journalist; born near New Lexington, Ohio; correspondent in Franco-Prussian War, and Carlist uprising in Spain; reports on Turkish atrocities in Bulgaria influenced Russo-Turkish War and Bulgarian independence; made a polar voyage described in 'Under the Northern Lights'.

McGee, Thomas D'Arcy (1825-68), Irish-Canadian poet, historian, and journalist C-65

McGill, James (1744-1813), Canadian merchant and philanthropist, born Glasgow, Scotland; settled in Montreal 1774 and became a partner of the North-West Company; founded McGill University.

McGillivray, Alexander (1740?-93), American chief of Creek and Seminole Indians; son of wealthy Scottish merchant and half-breed Indian princess, well educated by father's relatives in South Carolina, but returned to Indians; formidable enemy of U. S.; in 1790 at personal invitation of Washington made peace agreement with Americans, receiving among other favors, rank of brigadier general in U. S. Army.

McGillivray, Simon (flourished 1800-27), Canadian fur trader; joined North-West Company 1810; in 1821 signed agreement by which North-West Company and Hudson's Bay Company were amalgamated.

McGill University, a leading Canadian institution, at Montreal; chartered 1821, opened 1829; non-sectarian; arts and science, commerce, law, medicine, dentistry, engineering, architecture, agriculture, music, etc.; graduate courses; several affiliated colleges influence on modern football F-151b

McGregor, James Drummond (1838-1918), Canadian statesman, born New Glasgow, Nova Scotia; member of Senate of Canada 1903-10; lieutenant governor of Nova Scotia 1910-15.

MacGregor, John ("Rob Roy") (1825-92), Scottish traveler and writer; travels through European rivers and lakes with canoe of his own design are described in 'A Thousand Miles in the Rob Roy Canoe': C-76

MacGregor, Robert, or Campbell, Robert (1671-1734), celebrated Scottish outlaw, known as "Rob Roy" R-120

McGuffey, William H. (1800-73), American educator, born Pennsylvania; professor of ancient languages and of moral philosophy, Miami University, Oxford, Ohio 1836-39; president Ohio University 1839-43, professor moral philosophy University of Virginia 1845-73; compiled immensely popular series of readers and spelling books.

Mach (*māk*), Ernst (1838-1916), Austrian physicist and psychologist; professor of physics at Prague 1867-95, at Vienna 1895-1901; strongly influenced modern scientific and philosophical thought.

Machado (*mā-chā'dō*), Gerardo (1873-1939), president of Cuba 1925-33; second term marked by dictatorial oppression; after downfall a fugitive until 1937 amnesty; died in Miami Beach, Fla.: C-412

Machen (*māk'en*), Arthur (born 1863), English writer; 'The Hill of

Dreams', a fantasy, appealed strongly to a limited public; also wrote travel, adventure stories and essays ('Things Far and Near', 'Dog and Duck', 'Dreads and Drolls').

McHenry, James (1753-1816), American Revolutionary patriot, born County Antrim, Ireland; served successively as surgeon, secretary to Washington, and aide to Lafayette; major in war; kept private record of Constitutional Convention where he represented Maryland; secretary of war in Washington's cabinet.

Machete (*mā-chā'tā*), cleaver-like knife used as tool and weapon in Spanish-American countries: picture S-358

Machiavelli (*mā-kē-yū-vē'llē*), Niccolò (1469-1527), Italian diplomat and writer; secretary of Florentine republic; founder of modern science of politics; discarded morality as political principle ('The Prince', idealization of Caesar Borgia, foreshadowed 16th and 17th century identification of the monarch with the state)

developed politics P-293-4

Florence in times of F-107, 108

'The Prince' R-75

Machine (physics), device embodying one or more mechanical principles for the translation of motion M-103-6. See also in Index Machinery, for practical application friction in F-204, P-193 gyroscopic G-191-2 pendulum P-108-9 transforms energy E-266, P-192-3

Machine, calculating C-19-20. See also in Index Calculating machines

Machine, electrostatic, device for producing static electrification by friction, picture E-221

first invented by von Guericke E-231

Machine age M-10. See also in Index

Industrial Revolution; Inventions

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German literature affected G-63

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standard of living changed L-93a-b

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Machinery, mechanical devices for

doing work M-10-11. See also in

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tions; Mechanics; Tools; and the

names of various machines

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ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch



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  button making B-287, 288  
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Machu Picchu, an Inca ruin dis-  
covered 1911 in mountains in S.  
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Maciejowice (mäts-yë-yë-vët'së),  
battle of (1794), Poles under  
Kosciusko defeated by Russians  
K-40

Macintosh, Charles (1766-1843), Scot-  
tish chemist, inventor of processes  
for making sugar of lead, bleaching  
powder

waterproof fabric R-163-4

MacIntosh, William (1775?-1825),  
half-breed Creek Indian chief,  
born Georgia; leader of Lower  
Creeks on side of Americans in  
War of 1812; brigadier general in  
U. S. Army during Seminole cam-  
paigns (1817-18); for signing  
treaty (1825) ceding lands in de-  
fiance of tribal law, he was killed  
by party of Upper Creeks.

Mackail, John William (born 1859),  
English scholar and critic; pro-  
fessor of poetry Oxford University  
1906-11; translations of Greek and  
Latin literature, with criticisms;  
married daughter of Burne-Jones;  
quoted on Cicero L-68

Mackay, Alexander (died 1811),  
Canadian fur trader of North-West  
Company; accompanied Sir Alex-  
ander Mackenzie on expedition  
from Lake Athabaska to Pacific in  
1793; 1810 joined Pacific Fur  
Company; murdered by Nootka  
Indians.

Mackay (mä'ki), Clarence Hungerford  
(1874-1938), American capitalist,  
born San Francisco; son of John

W. Mackay; president of several  
telegraph and cable companies;  
director Metropolitan Opera Com-  
pany, New York City.

McKay, Donald (1810-80), naval  
architect and ship-builder, born  
Nova Scotia; emigrated to New  
York 1827; 1850 built his first clip-  
per ship, *Stag Hound*; other famous  
clippers: *Flying Cloud*, made San  
Francisco from New York in less  
than 90 days; *James Baines*, made  
Boston to Liverpool in 12 days, 6  
hours; *Lightning* holds record for  
greatest day's run under sail, 436  
nautical miles.

McKay (mä-kä'), Gordon (1821-1903),  
American inventor, born Newport,  
R. I.; inventions of boot and shoe  
machinery revolutionized that in-  
dustry: S-131, 132

Mackay (mä'ki), John W. (1831-  
1902), American capitalist, born  
Ireland; one of discoverers of Bo-  
nanza mines of Comstock lode,  
Nevada

statue, *picture* N-78

Mackaye (mä-kä'), Percy (born 1875),  
American dramatist and poet, born  
New York City; writer of numerous  
community masques and poetic  
plays ('Jeanne d'Arc'; 'The Scare-  
crow'; 'Yankee Fantasies'; 'This  
Fine-Pretty World'); made use of  
folk-lore of Kentucky mountaineers  
in 'The Gobbler of God'; 'Kentucky  
Mountain Fantasies'; and  
'Weathergoose—Wool'

McKean, Thomas (1734-1817), signer  
of Declaration of Independence,  
born New London, Pa.; member of  
Continental Congress 1774-83; gov.  
of Pennsylvania (1799-1808): D-42

McKeesport, Pa., industrial city on  
Monongahela and Youghiogheny  
rivers 12 mi. s.e. of Pittsburgh, in  
bituminous coal region; pop. 55,355;  
vast steel and iron works and tin  
plate plant: *map* P-112

McKees Rocks, Pa., industrial bor-  
ough on Ohio River 3 mi. n.w. of  
Pittsburgh; pop. 17,021; ships con-  
siderable lumber; iron and steel  
products, automobile parts, chew-  
ing gum: *map* P-112

McKenna, Joseph (1843-1926), Ameri-  
can jurist and statesman, born  
Philadelphia, Pa.; congressman  
1885-92; attorney general 1897-98;  
on U. S. Supreme Court bench 1898-  
1926; gained reputation for sound,  
conservative judgments.

McKen'na, Reginald (1863-1943), Brit-  
ish statesman and financier; liberal  
member, House of Commons, 1895-  
1918; Cabinet member; first lord of  
admiralty, home secretary, cancellor  
of exchequer; banker after  
1919.

McKenna, Stephen (born 1888) Eng-  
lish novelist; writes in twinkling  
entertaining style of British society  
and political circles; served with  
Intelligence Department in World  
War 1915-19 ('Sonia'; 'Vindica-  
tion'; 'The Datchley Inheritance').

Mack'ensen, August von (born 1849),  
German field marshal, associate of  
Ludendorff and Hindenburg in 1st  
World War; commanded decisive  
offensives against Serbia and Ru-  
mania  
defeats Russians W-157; Rumanians  
W-160

Mackenz'ie, Sir Alexander (1764-  
1820), Scottish explorer; employee  
North-West Fur Company; first  
white man to reach Pacific over-  
land: C-59

Alaskan voyage A-103  
explores Mackenzie River M-12

- leader of North-West Fur Company F-226.  
'Voyages' C-65
- Mackenzie, Alexander (1822-92), Canadian Liberal statesman, born Scotland; premier 1873-78; administration introduced vote by ballot, created Supreme Court of Canada, organized territorial government of Northwest Territories.
- Mackenzie, Sir Alexander Campbell (1847-1935), Scottish composer; principal of the Royal Academy of Music 1888-1924 ('The Rose of Sharon' and 'Bethlehem', oratorios; 'The Bride', a cantata; 'His Majesty', comic opera).
- Mackenzie, Compton (born 1883), English novelist, playwright, and poet; served in Dardanelles campaign in 1st World War; work distinguished for graceful style ('Carnival', dramatized; 'Vestral Fire', 'Sinister Street', 'The Enchanted Blanket', novels; 'The Four Winds of Love', series of novels; 'Kensington Rhymes'; 'The Windsor Tapestry').
- MacKenzie, Kenneth (1797-1861), a Scottish leader in fur trade; officer in British army in War of 1812; in charge of Fort Union: F-227
- McKenzie, Robert Tait (1867-1938), American sculptor and physical education director, born Almonte, Ontario, Canada; best known for sculptures of athletes; professor and director of physical education, University of Pennsylvania 1904-30, research professor after 1931; wrote 'Exercise in Education and Medicine' and 'Reclaiming the Maimed'.
- McKenzie, Roderick (died 1844), Canadian fur trader, born Scotland; emigrated to Canada 1784; built Fort Chipewyan on Lake Athabaska in 1788; became partner in North-West Company 1799; wrote history of fur trade ('Bourgeois de la Compagnie du Nord-ouest'); cousin of Sir Alexander Mackenzie.
- Mackenzie, William Lyon (1795-1861), Canadian politician and journalist M-12
- Mackenzie, District of, Canada, in w. part of Northwest Territories, about 527,490 sq. mi. N-170, map C-50b
- Mackenzie River, in n.w. Canada M-12, map C-50b valley, agriculture N-170
- Mack'ere!, a North Atlantic food fish M-12, F-74 fisheries F-80-1
- Mackerel family, the *Scombridae*, a large and important family of spiny-finned fish with spindle-shaped bodies; includes albacore, bonito, mackerel, tunny.  
'Mackerel sky' C-281
- McKim, Charles Follen (1847-1909), American architect, born Chester County, Pa.; in partnership with W. R. Mead and Stanford White designed Public Library of Boston, and other important buildings.
- Mackinae (*māk'i-nā*), Straits of, 4 mi. wide connecting lakes Michigan and Huron, map M-153
- Mackinae Island, Mich., island at n.w. end of Lake Huron in Straits of Mackinac; pop. 508: G-149, M-153, maps G-147, M-153, picture G-146
- Mackinaw trout, or Great Lakes trout T-145
- McKinley, Ida Saxton (1844-1907), wife of President McKinley W-93, M-13
- McKinley, William (1843-1901), 24th president of U. S. M-13-17 administration (1897-1901) M-13, 14-17  
'age of big business' M-15, U-247 Alaska gold fields discovered A-103-4, M-15 Gold Standard Act M-15 Hawaii annexed H-245, M-16 Hay-Pauncefote Treaty M-16 new inventions and a new era M-14-15  
'Open-Door in China' M-16, C-221k Philippine insurrection suppressed P-170 Samoan Islands divided S-20 Spanish-American War S-234-5: Dewey D-58-9 Taft in Philippines T-2 assassination M-17 early career M-13-14 'free silver' campaign and election M-14, B-254 memorials: Buffalo B-261; Columbus, picture O-213 Tariff Act (1890) M-14, H-229, T-14 wife W-93, M-13
- McKinley, Mount (native name Denali, or Traleyka), Alaska (20,300 ft.), highest mountain of North America M-13, map A-105, picture A-104 national park N-22b-c, M-13, picture A-104, map A-105
- McKinley Tariff Act M-14, H-229, T-14
- Mackinstry, Elizabeth, American artist and illustrator of children's books; work noted for lively imagination and humor ('Fairy Alphabet', 'Fairy Tales', by Hans Christian Andersen).
- Mackintosh, Sir James (1765-1832), English philosopher, lecturer, and lawyer replies to Burke B-278
- MacLar'en, Ian, pen name of Reverend John Watson (1850-1907), Scottish clergyman and author ('Beside the Bonnie Briar Bush').
- MacLaughlan, Donald Shaw (born 1876), American etcher, born Canada; lived in Boston, Mass., and in Europe; subjects chosen largely from France and Italy; noted particularly for architectural etchings.
- McLaurin, Charles (1872-1925), Australian surgeon and writer A-376
- MacLeish, Archibald (born 1892), American poet and librarian, born Glencoe, Ill.; Librarian of Congress since 1939; director of Office of Facts and Figures 1941-42; Pulitzer prize (1933) for 'Conquistador', epic of the conquest of Mexico by Cortez; wrote stirring radio plays 'Panic', 'Fall of the City', 'Air Raid'. His 'Land of the Free', 'Public Speech' are poems of world's unrest: A-182, picture A-183 quoted P-271
- MacLeod, Fiona. See in Index Sharp, William
- McLeod, John (1788-1849), Canadian fur trader and explorer, born Stornoway, Scotland; joined Hudson's Bay Company 1811 and conducted first group of colonists to Red River Settlement; active in disputes between Hudson's Bay and North-West companies.
- MacLeod (*māk-lōud'*), John James Rickard (1876-1935), Scottish physiologist; professor University of Toronto 1918-28; discovered insulin with Dr. Banting, with whom he shared Nobel award in medicine in 1923.
- McLoughlin (*māk-lōk'lin*), Dr. John (1784-1857), explorer, fur trader, and physician, born Rivière du Loup, Canada O-247-8
- MacLure, William (1763-1840), American geologist, born Scotland; made first geological map of America 1809; called "father of American geology"; used wealth in support of science.
- MacMahon (*māk-mā-ōh'*), Marie Edmé Patrice Maurice de (1808-93), duke of Magenta and marshal of France; crushingly defeated at Sedan 1870; president of France 1873-79.
- MacManus, Seumas (*shā'mūs*) (born 1869), Irish author of folk and fairy tales, stories of Irish history, poems, plays, born Donegal: S-303h
- McMaster, John Bach (1852-1932), historian, born Brooklyn; professor American history University of Pennsylvania after 1883 ('History of the People of the United States').
- McMaster University, at Hamilton, Ontario, Canada; Baptist; chartered 1887; arts, theology.
- MacMillan, Donald Baxter (born 1874), American explorer and author, born Provincetown, Mass.: prof. of anthropology, Bowdoin College; with Peary Arctic expedition 1908-09; since engaged in Far North exploration: pictures P-281 Byrd accompanies B-289
- MacMonnies (*māk-mūn'niz*), Frederick (1863-1937), American sculptor, born Brooklyn; great fountain in Court of Honor at Columbian Exposition in Chicago and Battle Monument at West Point: S-62 doors of Congressional Library W-24-5 Nathan Hale monument, picture H-199
- MacMurray College for Women (formerly Illinois Woman's College), at Jacksonville, Ill.; Methodist; founded 1846; arts and sciences, music, home economics, public speaking, physical education, fine arts, secretarial and nurse training.
- MacMurrough, Dermot. See in Index Dermot MacMurrough
- McNair, Lesley J. (born 1883), U. S. Army officer; formerly chief of staff of General U. S. Army Headquarters; made commander U. S. Army Ground Forces March 1942.
- McNary, Charles L. (born 1874), U. S. senator from Oregon 1917-; born Salem, Ore.; Republican candidate for U. S. vice-president 1940; co-author McNary-Haugen Farm Relief Bill.
- McNary-Haugen Farm Relief Bill C-354
- McNary-Woodruff Law F-157
- McNaughton, Andrew George Latta (born 1887), Canadian army officer, born Moosomin, Sask.; veteran of 1st World War; commander in chief of Canadian overseas force in 2d World War; resigned Dec. 1943.
- McNeely, Marian Hurd (1877-1930), children's writer, born Dubuque Iowa; South Dakota life is background of 'Jumping-off Place'.
- MacNeil, Hermon Atkins (born 1866), American sculptor, born Chelsea, Mass.; noted for Indian subjects McKinley memorial, picture O-213
- McNutt, Paul Vories (born 1891), statesman, born Franklin, Ind.; dean Indiana University School of Law 1925-33; governor of Indiana 1933-37; U. S. high commissioner to Philippines 1937-39; appointed head of Federal Security Agency 1939; made head of the War Manpower Commission in April, 1942: N-12j

ü=French u, German ü; gem, ȝo; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- Macomb', Alexander (1782-1841), American soldier, born Detroit, Mich.; distinguished himself in War of 1812 at Fort Niagara, Fort George, and Plattsburg, N. Y.; made commanding general U. S. Army, 1828.
- Macomb, Ill., city 59 mi. n.e. of Quincy; pop. 8764; clay and steel products; Western Illinois State Teachers College: map I-13
- Ma'con, Ga., in center on Okmulgee River, rapidly growing manufacturing city with large cotton, lumber, and flour mills; pop. 57,865; market for cotton and fruit; Wesleyan College for Women, Mercer University, Ballard Normal School (Negro): G-56, map G-56
- 'Macon', U. S. navy dirigible; destroyed in storm 1935: pictures B-28-9
- Macphail', Agnes Campbell (born 1890), first woman member of Canadian Parliament; elected 1921; influential worker for disarmament and world peace.
- Macpherson (māk-fēr'son), James (1736-96), Scottish author, professed "translator" (now generally believed author) of the poems of Ossian.
- McPherson, James B. (1828-64), American Civil War general, born Sandusky, Ohio; commanded Army of Tennessee during Sherman's Atlanta campaign; killed in battle before Atlanta.
- Macquarie (mā-kwār'i) Island, s.e. of Tasmania, to which it belongs; 170 sq. mi.; constantly visited by seal hunters penguins, picture P-284
- McRae, Milton Alexander (1858-1930), newspaper publisher, born Detroit, Mich.; in 1889 he and Edward W. Scripps began organizing chain of popular newspapers, and in 1897 organized press association which developed into United Press; wrote autobiography, 'Forty Years in Newspaperdom'.
- Macramé (māk-rā-mā') lace L-48
- Macready (mā-kra'dī), John A., transcontinental flight A-71, 74
- Macready, William Charles (1793-1873), celebrated English tragic actor, especially noted for Shakespearean rôles; toured in U. S. 1826 and 1843-44.
- McSweeney-McNary Law F-157
- MacSwiney, Terence (1879-1920), Irish leader; lord mayor of Cork; hunger striker against imprisonment for sedition; died of starvation in Brixton prison, London, after fasting 74 days.
- McTavish, John George (flourished 1808-19), Canadian fur trader of North-West Company; represented the company when Astoria was acquired from the Pacific Fur Company; 1819 taken prisoner by Hudson's Bay Company and sent to England for trial.
- McTavish, Simon (1750-1804), Canadian fur trader, born Scotland; one of the founders of the North-West Company; interested in eliminating competition among fur traders.
- MacVeagh (māk-vā'), Franklin (1837-1934), American merchant and political leader, born Chester County, Pa.; secretary of the treasury under Taft (1909-13).
- MacVeagh, Wayne (1833-1917), American lawyer and political leader, brother of Franklin; minister to Turkey 1870-71; U.S. attorney general 1881; ambassador to Italy 1893-97; writer and famous wit.
- Macy, Anne Mansfield Sullivan (Mrs. John A.) (1866-1936), teacher of Helen Keller K-10
- Madagas'car, island in Indian Ocean, e. of Africa; 228,000 sq. mi.; pop. 3,800,000: M-17-18, maps A-42a, b houses M-17, picture F-4 lemurs L-94 people A-39, M-17, 18 vanilla V-273
- 'Madama Butterfly', opera by Puccini, story O-231
- 'Madame Bovary', famous novel by Flaubert, published 1856; the heroine, Emma Bovary, is an irresponsible, selfish extravagant young woman who, involved in debt and intrigue, finally poisons herself.
- "Madame Deficit" M-64
- "Madame Veto" M-64
- "Mad Anthony" (Wayne) W-58-9
- Madariaga (mā-dā-rē-yā'gā), Salvador de (born 1886), Spanish man-of-letters and statesman; educated Madrid, Paris; journalist in London; director Disarmament Section League of Nations (1922-27); professor of Spanish, Oxford 1928-31; ambassador to United States 1931, to France 1932-4 ('Shelley and Calderon'; 'The Sacred Giraffe', novel; 'Christopher Columbus', biography): S-237
- Madden Dam, on Chagres River, Isthmus of Panama F-53
- Madder family, or Rubiaceae (rē-bī-d'-sē-ē), a family of plants, shrubs, and trees, including the woodruff, bouvardias, cinchonas, coffee, bed-straw, gardenias, and madder.
- Madeira (mā-dē'rā, Portuguese mā-dā'rā) Islands, group off n.w. coast of Africa; owned and governed by Portugal; 314 sq. mi.; pop. 215,000; people mostly concentrated on Madeira Island, largest of the group: M-18, map A-42a
- Madeira River, largest tributary of Amazon; flows n.e. 900 mi. from frontier of Bolivia through W. Brazil: maps B-226, S-208b
- Madeira-vine, a perennial twining vine (*Boussingaultia baselloides*) of the basella family, native to Ecuador but naturalized in S. U.S. Grows 10 to 20 ft.; leaves fleshy, oval, pointed; flowers tiny, white, in long feathery clusters, fragrant; also called mignonette-vine.
- Madeleine (mād-lēn'), church in Paris, pictures P-72, A-259
- Madero (mā-dā'rō), Francisco (1873-1913), president of Mexico 1911-13 M-142e, picture M-142f
- Madison, Dorothea Payne Todd ("Dolly") (1768-1849), wife of President Madison W-89-90, M-18, 19
- Madison, James (1751-1836), 4th president of U. S. M-18-20 administrations (1809-1817) M-19, 20 battle of Tippecanoe H-232, T-28 Creek Indian uprising I-68 Hartford convention W-10-11, M-20 new states: Indiana I-50; Louisiana L-208 2d Bank of the U. S. B-44 War of 1812: W-8-11, U-236-7 advocates Bill of Rights U-210 Annapolis convention U-207 contributor to 'The Federalist' M-19, H-205 early life M-18-19 elected president M-19 in Constitutional Convention U-207, 208 wife W-89-90, M-18, 19
- Madison, Wis., state cap. and attractive summer resort in s. center, 75 mi. w. of Milwaukee; pop. 67,447; varied manufactures; state university: W-126, map W-124 capitol, picture W-123: murals U-206 Four Lakes W-124 university, picture W-127
- Madison River, one of headstreams of the Missouri, 230 mi. long; rises in Rocky Mts.
- Madison Square, New York City, picture W-172
- "Madman of the North" C-154
- Madoera. See in Index Madura
- Madog, or Madoc, ap Owen Gwynedd. (1150?-80?), legendary Welsh prince; said to have discovered America on mysterious voyage in 1170.
- Madon'na, the Virgin Mary M-20 Holbein H-319 Michelangelo's 'Madonna della Pietà', picture M-148 Murillo's 'Immaculate Conception' M-304, picture M-303 Raphael R-50, 51, M-20: 'Madonna of the Chair' R-50, picture M-21; 'Sistine Madonna' R-50, M-20, picture P-17 Robbia's 'Madonna of the Architects', sculpture S-57 Titian's 'Assumption of the Madonna', picture T-99
- Madonna Lily L-136
- Madras (mā-drās'), a presidency or province of India; 142,260 sq. mi.; pop. 46,735,000: M-20, 22, I-32, map I-31 Hastings governs H-234
- Madras, India, cap. of Madras presidency; pop. 650,000: M-20, 22, maps I-30, A-332c captured by French C-271
- Madras (mādrās) cloth, a lightweight cotton fabric, usually woven with stripe effect; also a thin drapery fabric with design formed by floating weft; so named because first made near Madras, India.
- Mad'repore coral, picture C-363
- Madrid', cap. and railway center of Spain; pop. over 950,000: M-22-4, maps E-326d, S-226, picture S-229 Prado National Museum M-24, pictures M-23, table M-392
- Madrid, University of, largest in Spain and one of the leading institutions of Europe prior to Spanish civil war (1936-39); founded 1508; became chief Spanish university in 1836, when University of Alcalá was moved to Madrid and combined with it.
- Mad'rigal, a short lyric poem, generally on the subject of love, usually in 6 to 13 iambic lines, marked by terseness and quaintness of expression. In music the term is applied to a part song for several voices, simple in style with lively rhythms and without accompaniment.
- Mad River, in Ohio, 100 mi. long D-22
- Madrona, or madrone, evergreen tree (*Arbutus menziesii*) of heath family, native to foothills of Pacific coast. Grows 20 to 100 ft.; bark rough, brown; shiny, leathery leaves; tiny white flowers in long, erect clusters; orange-red fruit. Wood is light pink with deep red spots; used as veneer. Sometimes called laurel-wood, manzanita, and madrono.
- Madstones, porous stones popularly believed to absorb poison from the wounds made by mad dogs and venomous snakes.
- Madura (mā-dg'rā), British India, city in Madras Presidency, 270 mi. s.w. of Madras; pop. 185,000; fine Hindu architecture: maps I-30, A-332c

Key—cāpe, āt, fār, fāst, whāf, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dē; cūre, būt, rūde, fūll, būrn;



Madura, Dutch Madoera, island in Netherlands Indies n. of e. Java; 1725 sq. mi.; pop. 1,965,000; numerous hot springs and a mud volcano; island is a plateau-like prolongation of the n. Java limestone range: J-205, map A-332c

Mad widow, a bird. *See in Index* Limpkin

Maender River. *See in Index* Maender River

Maecenas (*mā-sē'nās*), Gaius (73?-8 B.C.), wealthy Roman patron of Horace and Vergil; name proverbial as that of liberal patron of letters; in Eugene Field's slang phrase, "Maecenas pays the freight"

Vergil and V-284, picture R-129

Maelstrom (*māl'ström*), or malström, celebrated whirlpool or current n. of Norway, near s.w. end of Lofoten Islands W-85, N-174

Maerlant (*mār'lānt*), Jacob van (1235?-1300?), Flemish poet, called "father of Dutch literature"; early work free translations of French romances; later wrote scientific and historical works.

Maestricht, Netherlands. *See in Index* Maastricht

Maeterlinck (*mā'tēr-līngk*), Count Maurice (born 1862), Belgian dramatist and essayist M-24

quoted: bees B-73; Ghent G-84; leisure L-93

Mafeking (*mā'fē-kīng*), Union of South Africa, town in Cape of Good Hope province; pop. 5000; trading center for w. Transvaal and Bechuanaland; seat of administration for Bechuanaland Protectorate; English under Baden-Powell besieged by Boers Oct. 12, 1899 to May 17, 1900: map A-42a

Mafia (*mā'fē-ā*), a powerful Sicilian secret organization S-140

U.S. controversy H-230

Magadi (*mā'gā-dē*) Lake, in Kenya Colony, British East Africa, s.w. of Nairobi; about 30 mi. long; large carbonate of soda deposits.

Magallanes (*mā'gā-yū'nās*), Chile, also Punta Arenas, free port on Strait of Magellan; pop. 24,000; mining and stock-raising district; exports wool: C-207c-d, map C-206

Magazine, a publication M-25-7. *See also in Index* Newspapers advertising A-23, 24

agricultural, U. S. A-54

bibliographical description B-106-7

children's magazines L-162-3

circulation, audit for advertising A-24b

definition M-26

engraving processes E-296-8

printing P-348

Magazine Mountain, one of two highest peaks in Arkansas (2800 ft.), about 45 mi. s.e. of Fort Smith; Blue Mountain near by is same height.

Magdalen (*mā'dlīn*) College (St. Mary Magdalen), Oxford O-260, picture O-258

Magdalena (*mā'gā-dā-lā'nā*), river of Colombia; rises in Andes in s.w., flows n. 1000 mi. to Caribbean at Barranquilla; chief route to interior: C-305, 306, map C-305

steamer, picture S-206c

Magdalena Bay, on s.w. coast of Lower California, Mexico; tuna, mackerel, sardines: map M-133

Magdalene. *See in Index* Mary Magdalene

Magdalenians, people of Old Stone Age, of later culture than Cro-Magnons; name from La Madeleine, France, where remains were found.

Magdalen Islands, Quebec, Canada, in Gulf of St. Lawrence about 54 mi. n.w. of Cape Breton; cod, herring, and seal fisheries; pop. 8255: map C-50c

Magdeburg (*mā'gā-dū-burk*), Germany, city on Elbe River, 75 mi. s.w. of Berlin; pop. 325,000; sugar refining, textiles, machinery: map G-66

Thirty Years' War G-190

Magee, Augustus W. (1790-1813), American filibuster; graduate U. S. Military Academy (1809); led expedition into Mexican Texas (1812-13) with the Mexican patriot Bernardo Gutiérrez.

Magellan (*mā-gē'lān*), Ferdinand (Fernão de Magalhães) (*mā-gē'l-yīnsh'*) (1480?-1521), Portuguese navigator M-27-8, A-144, maps A-143, M-27, pictures E-131, M-28

discoveries M-28; Guam G-181; Patagonia P-86

Magellan, Strait of, passage between mainland of South America and Tierra del Fuego S-205e, maps S-208c, d, C-206

discovered by Magellan M-28

Magenta (*mā-gē'n'tā*), town in n. Italy 15 mi. w. of Milan, scene of battle (1859) I-157

Magenta, a color, picture C-308h

mixtures C-308f-i

Maggiore (*mā-gō'rā*), Lake, in Switzerland and n. Italy, 83 sq. mi.; famous for scenery: maps S-351, I-156, picture E-321

Maggot, a fly larva F-128, picture F-129

Maghmela, a Hindu bathing festival held at Allahabad, India, a place of pilgrimage, at confluence of Jumna and Ganges rivers.

Magi (*mā'gī*) (from Persian *magu*, meaning magician; English singular, magus), members of a priestly caste of ancient Medes and Persians. Name is applied also to the "wise men" in the Bible (Matthew ii) who followed the star to Bethlehem. Bible story does not name them nor give their number, but Christian tradition (about 7th century) makes them three kings, Melchior, Gaspar, and Balthazar. Their bodies are said to have been brought to Constantinople by Empress Helen, mother of Constantine, thence taken to Milan, and finally to Cologne in 1162 by Frederick Barbarossa. They are often called the Three Kings of Cologne

in Zoroastrianism Z-232

pay homage to Jesus J-213

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North American Indians I-64

origin of word Z-232

Pacific Islands P-5, M-29, E-142c

Sumatra S-325

tricks explained by hypnotism H-378

witchcraft W-127-8

'Magic Flute, The' (1791), opera by Mozart; fantastic story contains allegorical allusions to politics, nationalism, and Free-masonry.

Magic lantern S-285-6

Maginot (*mā-shē-nō'*) Line, French fortifications F-182, W-178c

Magliabecchi (*mā-lyā-bēk'ē*), Antonio da Marco (1633-1714), Italian goldsmith and scholar, born Florence; prodigy of learning and avid collector of books: L-105

Magma (*mā'g'mā*), a mass of material in semi-liquid form in sugar refining S-320

Mag'na Car'ta, charter of English liberties M-33, E-271

Charter of Liberties basis of H-275 in British Museum E-328

King John signs J-221-2, M-33

provisions D-46, M-33

turning point in history G-126

Magna Grae'cia, in ancient geography, name of Greek settlements in s. Italy and Sicily G-156, map G-154

Rome conquers R-132

Magnesia, or magnesium oxide, a white powdery substance obtained by burning magnesium or magnesium salts: C-177

rubber vulcanization R-164

Magne'sia, battle of (190 B.C.), decisive victory of Romans over Antiochus the Great of Syria at ancient town of Magnesia, Asia Minor, 20 mi. n.e. of Smyrna; brought w. Asia Minor under Roman control.

Magnesia, milk of, emulsion of magnesium hydroxide in water M-33

Magnesian limestone, same as dolomite M-182

Alpine district A-136

Mag'nésite, or magnesium carbonate M-33

in dolomite M-182

Magne'sium, a light, silver-white metallic element M-33, C-175, table C-168

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speedometer employs S-244

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Magnetic brake B-225

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jeañ); zh=French j (z in azure); κ=German guttural ch

Magnetic declination, or variation, angle between magnetic and true north C-326, *picture* C-327  
 Magnetic deviation, of compass C-326  
 Magnetic Equator. *See in Index* Aclitic Line  
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 Magnetic speedometer S-244  
 Magnetic variation, or magnetic declination, angle between magnetic and true north C-326, *map* C-327  
 Magnetism. *See in Index* Magnet and magnetism  
 Magnetite, or lodestone, a black magnetic iron ore (Fe<sub>3</sub>O<sub>4</sub>) I-135, M-182  
 compass, early C-326  
 magnetic properties M-34  
 Magneto, an electric generator E-217  
 Magnetometer, an instrument for measuring the strength, direction, dip, or all three, of the earth's magnetic field at any point.  
 Magnificent (*măg-nîf'i-kăt*). from Latin *Magnificat anima mea Dominum*, "My soul doth magnify the Lord," Mary's answer to Elizabeth's greeting; sung in vesper service of Roman Catholic church and evening service of Anglican church.  
 Magnification, in physics, enlargement of an image by a lens L-96-7  
 limit in microscope M-157  
 limit in telescopes T-39  
 Magnifying glass L-96-7  
 Magnitogorsk (*măg-ně-tō-gôrsk'*), city in w. cent. Siberia on Ural River; founded 1929 and named for Magnet Mts.; vast resource of iron and other minerals; large steel mills; pop. 145,000; *map* A-332b  
 Magnitudes of stars S-274  
 Magnolia, a flowering tree M-35-6  
 Magnoliaceae (*măg-nō-lě-ă-sě-ě*), the magnolia family of plants.  
 Magnolia State, popular name of Mississippi.  
 Magnus, Albertus. *See in Index* Albertus Magnus  
 Magoffin, Beriah, governor of Kentucky C-253  
 Ma'gog. *See in Index* Gog and Magog  
 Magog, Quebec, Canada, town at n. end of Lake Memphremagog, about 75 mi. e. of Montreal; pop. 6302; saw mills, textile works; fishing resort; *map*, inset C-50c  
 Mag'ot monkey M-230  
 Magpie, bird of crow family M-36  
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 Magpie mushroom, *color plate* M-306a-b  
 Maguey (*mă-gwă'*) plant, or agave A-46, M-137, 140, P-169  
 fiber, preparing, *picture* M-139  
 Magyaria (*măd-yă'r'i-ă*), native name of Hungary.  
 Magyar (*măj'yăr*, Hungarian *măd'yăr*) language H-360-1  
 Magyars, a Finno-Urgic race appearing in Europe in 9th century; dominant race of Hungary: H-360-2, A-381, 383. For history *see* Hungary  
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 related peoples, *diagram* R-9b: Finns F-44  
 'Mahabharata' (*mă-hăb-hăr'ă-tă*), Hindu epic I-41

Mahaf'fy, Sir John Pentland (1839-1919), Irish scholar, Greek and Roman historian ('Social Life in Greece from Homer to Menander'; 'Silver Age of the Greek World').  
 Mahan (*mă-hăn*'), Alfred Thayer (1840-1914), American naval officer and historian, born West Point, N. Y.; greatly influenced naval policies of Germany, Great Britain, and U. S. by book 'The Influence of Sea Power upon History'; 'The Interests of America in Sea Power': N-56f  
 Mahanoy' City, Pa., industrial borough 55 mi. n.e. of Harrisburg in anthracite coal-mining region; pop. 13,442; shirts, hosiery, tobacco, and cigars.  
 Maharajah. *See in Index* Rajah  
 Mahdi (*mă'di*), the Mohammedan Messiah; various pretenders have claimed the title; the Sunnites hold that the true Mahdi has not yet appeared; name given particularly to Mohammed Ahmed (1843-85): G-121  
 Mahé (*mă-ă'*), French India, colony on Malabar Coast, India; 23 sq. mi.; pop. 14,000; *map* I-31  
 Mahican (*mă-h'kăn*), or Mohican, Indian tribe and confederacy of Algonquian stock originally living in Hudson Valley, later in Massachusetts, Connecticut, and also Pennsylvania, where most of them were absorbed into the Delaware Confederacy: I-53  
 home I-59  
 Mahieu, Thomas (Italianized Maioli) (died 1575?), French book collector; bindings made for him, bear the legend "Thomae Maioli et amicorum": B-183  
 Mahler (*mă'lěr*), Gustav (1860-1911), Austrian musical conductor and composer, born Kalischt, Bohemia; conductor in various cities; director Court Opera, Vienna; conductor Metropolitan Opera House, New York, 1907-09, New York Philharmonic Orchestra 1909-11; composed elaborate works in symphonic form.  
 Mahmud (*mă-măd'*) II (1785-1839), sultan of Turkey, succeeded 1808; suppressed Janizaries; forced to recognize independence of Greece.  
 Mahmud of Ghazni (971-1030), Afghan conqueror, sultan of Ghazni 997-1030; devout Moslem and famed chiefly for holy invasions of India; these conquests added untold riches to Empire of Ghazni which, during Mahmud's reign, rose to its height of power and wealth.  
 Mahog'any M-36-7  
 furniture I-104, M-36, 37  
 gumwood used as imitation G-188  
 logs, Central America, *picture* C-133b  
 mill at New Orleans, *picture* N-102  
 swamp mahogany, a eucalyptus E-315  
 Mahom'et. *See in Index* Mohammed  
 Mahón (*mă-hôn'*), capital of Minorca, one of Balearic Isles; fine harbor; Port Mahon near by; pop. 17,000.  
 Maho'ning River, rises in e. Ohio, flows s.e. in Pennsylvania joining Shenango River to form Beaver; length 100 mi.  
 at Youngstown Y-208  
 Maho'ny, Francis Sylvester ("Father Prout") (1804-66), Irish poet and humorist; expelled from Jesuit Order, took up literary life, writing papers of "Father Prout"; 'Bells of Shandon' best-known poem.  
 Mahout', elephant driver E-249

Mahrattas (*mă-ră'tăz*), or Marathas, Hindu tribes of central and w. India; conquered and ruled many states, forming a powerful confederacy 17th and 18th centuries: I-38  
 Hastings subdues H-234  
 Wellington crushes W-71  
 Mähren. *See in Index* Moravia  
 Mährisch-Ostrau, Germany. *See in Index* Moravská Ostrava  
 Maia (*mă'ă*), in Greek mythology, daughter of Atlas and mother of Hermes.  
 Maidenhair fern F-26  
 Maidenhair tree, another name for ginkgo tree G-88, T-136  
 Maid Marian, Robin Hood's sweetheart R-118-19  
 Maid of Orleans, name given to Joan of Arc after her victory at Orleans. *See in Index* Joan of Arc  
 Maidstone, England, county town of Kent; pop. 42,000; on Medway River, 30 mi. s.e. of London; grain market; Kentish Royalists defeated by Fairfax 1648.  
 Maidu (*mă'də*), a group of many small Indian tribes of e. cent. California; numbered 5000 to 6000 at the time of the Gold Rush, but now only about 500 survive.  
 Mail, classes of P-322. *See also in Index* Postoffice and postal service  
 Maillol (*mă-yôl'*), Aristide (born 1861), French sculptor; influenced by classicists and post-impressionists; works distinguished for monumental quality and for calm restraint, dignity, and repose: S-62  
 Mailomats P-322  
 Mail-order advertising A-24a  
 Mail plane. *See in Index* Air mail  
 Maimonides (*mă-môn'i-děz*), or Moses ben Maimon (1135-1204), great Jewish rabbi, philosopher, and physician; born Cordova, Spain; fled from persecution and lived in Fez, Acre, Jerusalem, and Cairo; became physician to Saladin; wrote, chiefly in Arabic, medical works, commentaries on the Bible and Talmud; in his 'Guide to the Perplexed' sought to harmonize philosophy of Aristotle with Biblical and rabbinic teaching.  
 Maine, old province in n.w. France, s. of Normandy; chief city, Le Mans; *map* F-179  
 English fief under Henry II H-275  
 Maine, northernmost of New England states; 33,215 sq. mi.; pop. 847,226; cap. Augusta: M-37-41, *maps* M-38, U-188c  
 Acadia National Park N-19-20, M-39  
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 Battleship Day H-320

Key—cāpe, āt, fār, fāst, whāṭ, fāll; mē, yēt, fērñ, thēre; īce, bīt; rōw, wōn, fōr, nōt, dē; cūre, būt, rŷde, fŷll, būrn;

Maine, University of, at Orono, Me.; state institution founded 1862 (opened 1868); arts and sciences, agriculture, technology, education, graduate school  
former land grant college E-182  
Mainland, one of Orkney Islands O-251

Mainland, or Pomona, one of Shetland Islands S-116

Main River, in s. Germany formed by Red and White Main; has tortuous course w. for 310 mi., joining Rhine opposite Mainz: map G-66  
canal to Danube River D-13  
Frankfort on F-188

Mains, water P-260  
early systems W-54

Mainspring, of a watch W-37, 39

'Main Street', a widely-read novel by Sinclair Lewis published 1920, picturing the dullness and smugness of a small mid-western town, "Gopher Prairie." The phrase "Main Street" has since become synonymous with provincialism.

Maintenon (*mān-tū-nōn'*), Marquise de (1635-1719), 2d wife of Louis XIV M-41

Mainz (*mānts*) (French Mayence), commercial and manufacturing city and fortress in s.w. Germany on Rhine River opposite mouth of Main; pop. 131,000; head of league of Rhenish towns in 13th century; famous medieval cathedral; furniture, leather goods; trade in wine: map G-66

early printing center P-347  
Gustavus Adolphus at G-190

Maioli (*mā-yō'lē*) bookbindings B-183

Maiolica (*mā-yō'l'i-kā*, Italian *mā-yō'lē-kā*) pottery P-331, pictures P-335

Maipo (*mā'pō*), or Maipu, river of Chile; rises in Andes, flows 120 mi. w. to Pacific just s. of Santiago; decisive battle of Chilean War for independence fought on banks (1818).

Mair, Charles (1838-1927), Canadian poet and journalist, remembered for 'Tecumseh', a poetic drama revealing insight into Indian character.

Maisonnette (*mā-zōn-nāv'*), Paul de Chomedey, Sieur de (died 1676), founder of Montreal and its governor for 22 years; an able administrator, but removed because of governor general's jealousy.

Maitland, Frederick William (1850-1906), English jurist and historian ('History of English Law'; 'Canon Law in England').

Maitland, Lester J., aviator A-74

Maitland, Sir Peregrine (1777-1854), English soldier, lieutenant governor of Upper Canada 1818-28 and of Nova Scotia 1828-32.

Maize, name of grain and plant called "corn" in U. S. See in Index Córñ

Mai'zolith, a hard rubber substitute C-368

'Majestic', an ocean liner S-128

Majesty, word used to express power and dignity of a sovereign; in Roman state signified supreme authority of ruler. "His Majesty" now applied in Europe to any reigning king, "His Imperial Majesty" to any reigning emperor.

Maiolica pottery. See in Index Maiolica

Major, Charles (pen name Edwin Caskoden) (1856-1913), American lawyer and writer of popular novels, born Indianapolis ('When Knighthood Was in Flower'; 'Dorothy Vernon of Haddon Hall').

Major, in U.S. Army A-307d, b insignia, picture U-178

Major, in music, term used in defining size of intervals; a major (greater) third contains four semitones as opposed to the minor (lesser) which contains three; major scale and major mode are characterized by presence of major third.

Majorca (*mā-jōr'kā*), also Mallorca, largest of Balearic Islands (Spanish); 1330 sq. mi.; pop. about 295,000; cap. Palma: B-17, map S-226  
maiolica ware named for P-331

Major domus. See in Index Mayor of the Palace

Major general, in U.S. Army, next above a brigadier general and next below a lieutenant general insignia, picture U-178

Majority, in election E-213-14

Major scales, in music S-198

Majuba (*mā-jū'bā*) Hill, in extreme n.w. of Natal, South Africa, where Boers defeated British 1881: S-200

Majuscules (*mā-jūs'kūlz*), Latin capital letters A-135, B-177

Makah (*mā'kā*), a tribe of Nootka Indians living about Cape Flattery, Wash.

Makal'la, Mukalla, or Mokalla, important seaport in Hadhramaut, Arabia; pop. about 18,000: map A-242

Makassar, Dutch spelling of Macassar. See in Index Macassar; Macassar, Strait of

Make-up, for motion pictures M-289

Makino (*mā-kē'nō*), Viscount (born 1861), Japanese statesman and diplomat; represented Japan in Versailles Peace Conference 1919.

Malabar (*mā'lā-bār*) Coast, name often given to w. coast of India as far n. as Bombay; properly confined to s. part; scene of Mohammedan revolt 1921-22: map I-30

Malabar Hill, Bombay B-171

Malacca (*mā-lāk'ā*), Straits Settlements, British territory on w. coast of Malay Peninsula between Singapore and Penang; 640 sq. mi.; pop. over 200,000; cap. Malacca (pop. 40,000): M-43, map A-332c

Malacca, Strait of, channel about 500 mi. long between Sumatra and w. coast of Malay Peninsula M-43, map E-142

Malacca cane, a species of cane (*Calamus scipionum*) obtained from Malacca and neighboring regions; of rich brown color; used for walking sticks.

Makchi (*mā'lā-kī*), the 39th book of the Old Testament and last of the minor prophets, written between 464 and 424 B.C.; authorship disputed.

Malachite (*mā'lā-kit*), a bright green copper ore, commonly found massive though occasionally in stalactitic and other forms; chemical formula Cu(OH)CO<sub>3</sub>; found in the Ural Mts., in France, and elsewhere: M-182  
a gem stone G-28

'Malade Imaginaire, Le' (*lā mā-lād' ē-mā-zhē-nār'*), a play by Molière M-217

Malaga (*mā'lā-gā*, Spanish *mā'lā-gā*), Spain, manufacturing city and seaport on Mediterranean, 65 mi. n.e. of Gibraltar; pop. 190,000; ships wine, grapes, raisins, olives; taken from Moors by Christians 1487; sacked by French 1810: map S-226

Malagasy (*mā'lā-gās'i*), native of Madagascar M-17-18

Malamute, Eskimo dog D-82

Mal'uprop, Mrs., character in Sheridan's play 'The Rivals' constantly using wrong word with sound resembling right one, as "an allegory on the banks of the Nile."

Mäl'ar, Lake, Sweden, extends inland from Baltic Sea at Stockholm; 450 sq. mi.; of irregular shape and contains some 1200 islands: map N-173, picture S-337

Malar (*mā'lēr*), the cheek bone S-156, picture S-156

Malaria, disease consisting usually of successive chill, fever, and "intermission" or period of normality India I-33

Panama P-46

quinine a remedy Q-8

spread by mosquitoes M-267-70: effect on civilization M-266; Major Ronald Ross demonstrates M-270

Makaspina (*mā-lā-spē'nā*) Glacier, largest glacier in Alaska, w. of Yakutat Bay; covers 1500 sq. mi. and has front 70 mi. long: A-101

Malatya (*mā-lā-tē'ā*), or Malatia, Turkey, important trade center in e. Asia Minor; pop. 27,000; suffered earthquake 1893; massacre of Armenians 1895.

Malayan bear, or sun bear B-69, 67

Malay (*mā-lā'* or *mā'lā'*) Archipelago M-41. See also East Indies

Malay Peninsula, s.e. projection of Asia M-41-3, maps I-30, A-332c  
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Singapore S-153

Malays, natives of Malay Peninsula and adjacent islands M-42  
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Chamorro G-181  
East Indies E-142b-c

Java J-205

marriage customs F-8

piracy P-222

racial affinity, diagram R-9b

social organization F-9-10, 11

Thailand T-73a

Malay Seas, part of Pacific Ocean including Arafura, Banda, Celebes, Flores, Java, Molucca, and Sulu seas, and Macassar Strait.

Malaysia, name loosely applied to regions in Asia and in Asiatic waters chiefly inhabited by Malays; includes Malay Peninsula, Netherlands Indies (except New Guinea), and the Philippines.

Malay States, Federated, British Malaya, protectorate comprising states of Perak, Selangor, Negri Sembilan, and Pahang; 27,540 sq. mi.; pop. over 2,000,000; cap. Kuala Lumpur (pop. 115,000) in Selangor: M-43, map A-332c. See also in Index Malay Peninsula  
flag F-96, color plate F-89

Malay States, Unfederated, British Malaya, collective name of five states, Johore, Kedah, Perlis, Kelantan, and Trengganu, in Malay Peninsula; under British protection; 22,100 sq. mi.; pop. over 1,700,000; with Brunei, in Borneo, sometimes included in Unfederated Malay States, total area about 24,500 sq. mi.; pop. over 1,730,000: M-43

Malay tapir T-12

Malcomia (*mā'l-kō'mi-ā*), a genus of annual and perennial plants of the mustard family, native to the Mediterranean region. Low-growing,



- with narrow gray-green leaves; flowers tiny, 4 petals, white, purple, or red, in loose clusters; used in rock gardens; also called Malcolm stock or Virginia stock.
- Malden** (*mɔl'dɛn*), Mass., manufacturing city on Malden River, 4 mi. n. of Boston; pop. 58,010; rubber boots and shoes, shoe lasts, automobile tires, knit goods, proprietary articles, leather goods.
- Mal'dive Islands**, also **Cowrie Islands**, group of 13 coral islets in the Indian Ocean s.w. of India; pop. 80,000 (Mohammedan); ruled by a sultan, tributary to Ceylon.
- Maldon** (*mɔl'dɔn*), England, small port on Blackwater River 40 mi. n.e. of London; Danish victory over English in 991.
- Malea**, Cape, also **Malla**, Cape, the s.e. extremity of Morea, the s. peninsula of Greece.
- Malebranche** (*mål'bränsh'*), Nicolas (1638-1715), French philosopher, follower of Descartes.
- Malecite** (*mål'ê-sit*), division of the Abnaki group, of Algonquian stock; lived in Canada and Maine.
- Maleo** (*mål'ê-ô*), an Australian bird of the megapod family, *color plate B-130*
- Malherbe** (*mål-êrb'*), François de (1555-1628), French poet, critic, and courtier; wrote verse about royal persons and state events; poetry and criticism influenced development of French classicism: *F-196*
- Malla**, Cape. *See* Malea, Cape
- Malibran** (*mål-lê-brän'*), Maria Félité (1808-36), French mezzo soprano opera singer, daughter of Manuel Vicente Garcia; famed as much for her acting and personality as for her remarkable voice; married de Bériot, violinist.
- Mal'ic acid**, an organic acid found in juices of certain plants and fruits, such as apples, gooseberries, rhubarb, and grapes.
- Malinche** (*mål-lên'châ*), Cortez' interpreter *C-372*
- Malines** (*mål-lên'*), Belgium, also **Mechelen**, manufacturing city 14 mi. s. of Antwerp; pop. 61,000; ecclesiastical center; largely destroyed in 1914 by Germans in drive on Antwerp.
- Malines**, or **maline**, silk net similar to tulle but stiffer; used in millinery.
- Malinowski**, Bronislaw (1884-1942), English anthropologist, born Poland; professor of anthropology at University of London after 1927; visiting professor at Yale University 1940-41; author of many distinguished studies; member of Mond expedition to New Guinea and Melanesia 1914 ('Argonauts of Western Pacific', 'Foundations of Faith and Morals').
- Malipiero** (*mål-ê-pê-â'rô*), Gian Francesco (born 1882), Italian composer; a leader among Italian modernists, shows also romantic and poetic qualities.
- Mal**, park in Washington, D.C. *W-26, picture W-27*
- Mal'ard**, a common river duck *D-116, 118, picture D-117, color plate B-134*
- trap, *picture B-145a*
- Malarmé** (*mål-lâr-mâ'*), Stéphane (1842-98), French poet, born Paris; taught English; sought new prose and poetry forms and led Symbolist School of poetry; much of work very obscure; admirable translation of Poe's poems.
- Malleability**, property of a substance by which it withstands hammering or rolling into thin sheets, often called foil or leaf, without breaking aluminum *A-138*
- copper *C-357*
- example of cohesive force *P-190*
- gold *G-113, pictures G-114*
- iron and steel *I-134, 142*
- silver *S-152*
- tin *T-98*
- Malleable iron**, cast iron rendered malleable by long heating with hematite or other substance which lowers its carbon content *I-142*
- Mal'lee-bird**, an Australian megapod egg hatching *E-192*
- Malleus** (*mål'ê-ûs*), or hammer, bone of ear *E-126, diagram E-127*
- Mallophaga** (*mål-lôf'â-gâ*), an order of wingless parasitic insects consisting of the bird-lice.
- Mallorca Island**. *See in Index* Majorca
- Mallory**, Stephen Russell (1813-73), American lawyer and political leader, born Trinidad, West Indies; U.S. senator from Florida 1851-61; as secretary of the navy of the Confederacy he advocated the construction of ironclad warships; political prisoner for 10 months at close of war.
- Mallow**. *See in Index* Malvaceae
- Malmaison** (*mål-mê-zôn'*), château near Paris, home of Empress Josephine, later of Empress Eugénie.
- Malmédy** (*mål-mû-dê'*), town and district in e. Belgium 25 mi. s.e. of Liège; ceded by Germany 1919; regained by Germany 1940: *map B-87*
- Malmö** (*mål'mû*), 3d city of Sweden, seaport and industrial center on s. coast; pop. over 130,000; ferry to Copenhagen, Denmark: *S-337*
- Malnutrition** *F-146*
- importance of vitamins *V-310-12*
- Malope** (*mål'ô-pê*), an annual plant (*M. trifida*) of the mallow family, native to the Mediterranean.
- Hairy, growing to 3 ft.; leaves in 3 parts with heart-shaped base; flowers rose, purple, or white, veined in dark color, 2 to 3 in. across, with 3 large heart-shaped leaves holding each blossom.
- Mal'ory**, Sir Thomas (died 1470?), translator, compiler, and author (in part) of first notable English prose romance, 'Morte d'Arthur', printed by Caxton press in 1469 *A-316*
- place in literature *E-284*
- Malpighi** (*mål-pê-gê*), Marcello (1628-94), Italian physiologist, one of the first to apply the microscope to the study of animal and vegetable structure and the first to attempt the anatomy of the brain
- demonstrates blood circulation *B-158*
- Malpighian tubes**, appendages of alimentary canal of insects, serving the function of kidneys: *pictograph H-258a*
- Malplaquet** (*mål-plâ-kê'*), France, village near Belgian frontier, scene of French defeat (1709) in War of Spanish Succession.
- Malström**. *See in Index* Maelstrom
- Malt** *M-43*
- alcohol made from *A-112*
- bread-making *B-229*
- vinegar *V-300*
- Malta** (*mɔl'tâ*), British colony in Mediterranean; 122 sq. mi.; pop. 270,000; chief island Malta (95 sq. mi.) used as naval base: *M-43, map E-326d*
- Malta, Knights of**. *See in Index* Knights of Malta
- Malta fever**. *See* Undulant fever
- Malt'ase**, starch-digesting enzyme, in saliva *D-68, 69*
- Malted milk** *M-173*
- Maltese cat** *C-96*
- Maltese dog** *D-82*
- Maltese lace**, *picture L-49*
- Maltese orange**, or **blood orange** *O-240*
- Maltese pigeon**, or **hen pigeon**, *picture P-216*
- Malthus** (*mål'thûs*), Thomas Robert (1766-1834), English economist, author of Malthusian Theory; views on rent, in 'An Inquiry into the Nature and Progress of Rent', also important influence on Darwin *D-16*
- Malthusian Theory**, the theory advanced in Malthus' 'Essay on Population' that population, increasing in geometrical ratio, tends, unless checked, to outrun subsistence, which increases in arithmetical ratio.
- Malt'ose**, a double (disaccharide), sugar (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>) formed by enzymes from starch, reducible to glucose; differs from lactose and sucrose in structure of molecule; about one-third as sweet as cane sugar: *S-322*
- Malvaceae** (*mål-vâ'sê-ê*), the mallow family, a large group of plants, shrubs, and trees, usually with large showy flowers; among plants included are the cotton plant (*Gossypium*), okra or gumbo, marsh mallow, hollyhock, rose of Sharon, abutilon, and rose mallow.
- Mal'vern**, fashionable inland resort in w. England, 7 mi. s.w. of Worcester; pop. 18,000; on e. side of Malvern Hills, which extend n. and s. 9 mi.
- Malvern Hill**, battle of, the last of the Seven Days' Battles of the Civil War, July 1, 1862; fought on n. side of James River 15 mi. s.e. of Richmond; Confederates defeated: *map C-253*
- Malvo'lio**, in Shakespeare's comedy 'Twelfth Night', Olivia's solemn, pompous steward; self-important, serious, vain, he becomes almost pathetic as a laughing-stock and a center of practical jokes.
- Malvy** (*mål-vê'*), Louis Jean (born 1875), French politician of Socialist Radical group; member of Chamber of Deputies. Accused of treason 1917; acquitted, but banished for 5 years on verdict of criminal negligence; reelected to Chamber 1924; minister of interior 1926; chairman finance committee 1928.
- Mamaki** (*mål-mû'kê*), a paper mulberry tree (*Pipturus albidus*) of the nettle family found only in Hawaii.
- Mamaroneck**, N. Y., a town on Long Island Sound which includes the villages of Larchmont and Mamaroneck, about 23 mi. n.e. of New York City; pop. 13,034; rubber coats, clothing, food products.
- Mamelukes**
- rule in Egypt *E-199-200*
- Mamil'ius**, Octavius, leader of Latin revolt *R-130*
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- Mammals**, vertebrate animals that suckle their young *M-44*
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 winged: bat B-63-4  
**Mammary gland**, the milk-secreting organ in mammals; undeveloped in males.  
**Mam'mon**, riches, or the god of riches and cupidity; term used in the New Testament.  
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**Man**, Isle of, island in Irish Sea; 220 sq. mi.; pop. 50,000: M-49, map E-270a  
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**Manager-council plan of government** M-302  
**Managua** (mä-nä'gwä), cap. of Nicaragua, Central America, 30 mi. from Pacific coast; on Lake Managua; pop. over 100,000; disastrous earthquake 1931: N-141, map C-132  
**Manama** (mä-nä'mä), cap. and commercial center, Bahrain Islands; pop. 25,000: map A-242  
**'Man and Superman'**, play by George

Bernard Shaw modernizing the Don Juan legend; John Tanner, although opposed to love and marriage, is finally captured by Ann Whitefield, proving that in love woman, not man, is the pursuer.

**Manaos** (mä-nä'ös), or Manaus, capital of state of Amazonas, in n.w. Brazil on Rio Negro, 10 mi. from Amazon River; pop. 98,000: E-227, maps B-226, S-208b

**Manas'sas**, Va., village 25 mi. s.w. of Washington on Bull Run Creek; pop. 1302; scene of battle of Bull Run: B-271, C-254, map C-253

**Manasseh** (mä-näs'é), Hebrew tribe descended from Manasseh, elder son of Joseph; occupied central Palestine east and west of the Jordan River.

**Man-at-arms**, medieval soldier A-308

**Manatee**, or sea cow M-49

related to elephant E-250

**Manca de Vallombrosa**. *See in Index* Morés

**Mance**, Jeanne (1606-73), French foundress (1643) of the Hôtel-Dieu, the first hospital in Montreal.

### MANDATED TERRITORIES

The former German colonies and parts of the Turkish Empire were assigned at close of first World War to various powers to be held under mandates (treaties of trust) for League of Nations. These territories were assigned as follows:

To Great Britain: Trans-Jordan, Palestine, Nauru Island, Tanganyika Territory, parts of Togo and the Cameroons.

To Union of South Africa: Southwest Africa.

To France: Syria, parts of Togo and the Cameroons.

To Belgium: Ruanda-Urundi, part of former German East Africa.

To Australia: Northeastern New Guinea and adjacent islands.

To New Zealand: Western Samoa.

To Japan: all German islands in Pacific north of Equator.

**Manchester**, Conn., manufacturing town with large silk and velvet mills, 9 mi. n.e. of Hartford; pop. 23,799; cotton and woolen goods, needles, paper.

**Manchester**, England, seaport and textile manufacturing center; pop. 765,000: M-49, E-278, map E-270a transformed into seaport C-68, M-49

**Manchester**, N.H., largest city in state, 45 mi. n.w. of Boston; important manufacturing center; pop. 77,685; St. Anselm's College (men): N-86, 88, map N-86

**Manchester College**, at North Manchester, Ind.; founded 1889 by Church of the Brethren; arts and sciences.

**Manchester Ship Canal**, between Manchester and Liverpool C-68, E-278, map E-270a, table C-433

**Manchester terrier** D-82

**Manchouli** (män-jö'le'), Manchukuo, treaty port and cattle market in Hsingan province, n.w. Manchukuo; pop. 9000; strategically important because of its location on North Manchuria Railroad at Siberian border: map M-49a

**Manchu' Dynasty**, Ch'ing Dynasty, or T'at'ing Dynasty (1644-1912), last ruling dynasty in China before establishment of republic C-221j, M-49a

**Manchukuo** (män-jö-kwō or män-chy-kwō), also Manchoukuo, state including Manchuria and Jehol; more than 500,000 sq. mi.; pop. 43,000,000; cap. Hsinking: M-49-19b, J-192, C-221n, maps M-49a, A-332b

**Manchuria** (män-chy'ri-ä), region in e. Asia s. of Siberia, formerly part of China, now included in Manchukuo: M-49b-52, maps M-49a, J-186

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sika deer D-37

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**Manchus**, a nomadic Mongolo-Tatar people from Manchuria; probably of mixed origin; conquered China, ruling from 1644 to 1912; still found in Manchuria.

**Manciple's tale**, in 'Canterbury Tales' C-162

**Man'co** (1500?-44), Inca leader, set up by Pizarro as sovereign of Peru.

**Mandalay** (män'dä-lä), chief town in Upper Burma, on Irrawaddy River; pop. 135,000; silk mfrs.: B-279, maps I-30, A-332c, picture B-278b

**Man'dan**, tribe of Siouan Indians originally living along lower Missouri River; later driven n. to North Dakota: I-54

buffalo dance, picture I-66

houses I-59

Levis and Clark among L-99

**Mandan**, N. D., a city on the Missouri River, opposite Bismarck; pop. 6685; county seat; grain, livestock market; railroad shops; lignite deposits: map N-162

**Man'darin**, an official of China C-221e  
**Mandarin**, name given by foreigners to Kuan Hua, the official language of China C-221f

**Mandarin orange**, or tangerine O-240

**Mandates**, or mandated territories L-78, W-173, 174. For list see table on this page

**Man'deville**, Sir John (Jehan de Mandeville), reputed writer of a popular 14th-century book of eastern travels, written in French; book is now thought to have been compiled from earlier works by Jean de Bourgogne: color plate B-176a-b

**Man'dible** (from Latin *mandere*, to chew), term applied to: (1) chewing jaws of insects and other arthropods; (2) the lower jawbone of mammals; (3) the upper or lower part of a bird's beak

insects I-87, pictures I-82

lower jawbone S-156

**Mandin'go**, a large group of Negroes mixed with Hamites, dwelling in w. Africa from the Senegal River to Monrovia and numbering millions; they are Mohammedans and have attained a certain degree of culture under Arab teachers.

**Man'dolin**, stringed musical instrument played by plucking M-52, picture M-322

ü=French u, German ü; gem. gö; thin. then; ù=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch

**Man'drake**, or **mandragora**, a plant of the nightshade family M-53  
 may-apple so called M-91  
 rootstock B-269

**Mandrel**, a tool T-110

**Man'drill**, an African baboon M-230,  
 picture M-230  
 price paid by zoos Z-221

**Man-eating shark** S-103

**Man-eating tree**, a mythical tree frequently mentioned by writers of "tall tales" and located by them either in forests of Madagascar or the jungles of Mindanao Island in the Philippines. This tree is said to have a dark gray smokestack-like trunk and green leaves at the ends of vinelike stems. With a crackling noise the entire tree is said to bend over and the leaves reach out to grasp the passer-by.

**Manes** (*mā'nēz*), name applied by ancient Romans to spirits of ancestors and friends in the underworld; also to deities of the lower regions.

**Manet** (*mā-nē*'), Edouard (1832-83), French painter, born Paris; founder of impressionism and of the "open air" or *plein air* school, called most original painter of latter 19th century; works violently criticized for years, but finally attained highest recognition ('Olympia'; portrait of Zola; 'Boy with the Sword')  
 impressionist school P-24

**Man'etho**, Egyptian historian of 3d century B.C.; fragments of his work survive in Josephus.

**Mangabey** (*mān'gā-bā*) monkey, picture M-226

**Man'gan**, James Clarence (1803-49), Irish poet, a morbid genius who sincerely expressed the tragedy of Irish aspirations ('Romances and Ballads of Ireland'; 'The Nameless One', an autobiographical ballad; 'Dark Rosaleen'): I-132

**Manganese** (*mān-gā-nēs*'), a metallic chemical element M-53, C-175,  
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 alloys M-53, A-130, 131  
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 electrochemical activity E-239  
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 ore M-182  
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 producing regions M-53: Brazil, picture S-208; Montana M-244; Nevada N-77; Russia G-59  
 production, consumption, and trade of world, *photographs* M-188a, b

**Manganese dioxide**, or **pyrolusite**, a compound (MnO<sub>2</sub>) of manganese and oxygen  
 depolarizes electric dry cells E-215,  
*diagram* E-214

**Manganese spar**, an ore found in rhodonite. See in *Index* Rhodonite

**Mange**, an itchlike skin disease of domestic animals due to mites S-258

**Man'gel**, or **mangel-wurzel**, a beet B-79

**Manger scene**, in Christmas celebrations C-227, 229b, *picture* C-229

**Mangin** (*mān-zhān'*), Charles M. E. (1866-1925), French general (author 'Comment finit la Guerre', a masterly review of the 1st World War); served many years in Sudan, Morocco, and other French colonies; in 1st World War was corps commander at Verdun 1916; Sixth Army commander in Aisne offensive 1917  
 second battle of Marne M-67

**Man'go**, a fruit M-53

**Man'gosteen**, an East Indian fruit F-212

**Mangravitto** (*mān-grā-vē'tā*), Peppino (born 1896), Italian painter, teacher, and writer on art and art education; in United States after 1915; sensitive, well-designed paintings suggestive of Matisse and other French moderns.

**Mangrove**, a tree M-53  
 Burma B-278a  
 Florida F-116

**Manhattan**, Kan., city in agricultural region 106 mi. w. of Kansas City on Kansas River, at junction with Big Blue; pop. 11,659; dairying, poultry and stock raising; Kansas State College of Agriculture and Applied Science: map K-4

**Manhat'tan Beach**, New York City C-329

**Manhattan Borough**, part of New York City (Manhattan and several small adjacent islands); pop. 1,889,924: N-134

**Manhattan Bridge**, *picture* N-129,  
*table* B-342

**Manhattan College**, at New York City; for men; Roman Catholic (Christian Brothers); incorporated as college 1853 (Academy of the Holy Name 1849); arts and sciences, civil and industrial engineering, commerce, architecture.

**Manhattan Indians**, a tribe of the Wappinger confederacy that occupied Manhattan Island, New York City.

**Manhattan Island**, New York City N-123, 125, map N-130  
 Dutch obtain from Indians I-53, *picture* A-153

**Manhattanville College of the Sacred Heart**, at New York, N.Y.; Roman Catholic institution for women, founded 1851; arts and sciences, music.

**Manicheism** (*mān'i-kē-izm*), religion founded by the Persian Mani in 3d century as a composite of other known religions; believed world was a conflict between good and bad; at one time influential in East, but no longer followed.

**Manil'a**, cap. of Philippine Islands; pop. 625,000: M-53, maps A-332c, P-10b, *pictures* P-165, 169  
 average temperature M-53, P-165  
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 University of the Philippines, *picture* P-168

**Manila Bay**, Philippine Islands, inlet of China Sea in island of Luzon; fortified harbor: M-53

**Manila Bay**, battle of (1898) D-58-9, S-235

**Manila hemp** P-168-9, H-272, *pictures* R-154  
 cellulose source, *chart* C-123  
 rope and twine from R-153-5  
 scientific name B-37

**Manila paper** P-57

**Manil'ius**, Gaius, Roman tribune of the people in 66 B.C., whose proposal to give Pompey supreme command and unlimited power in the war against Mithridates was supported by Cicero in the famous oration 'Pro lege Manilia'.

**Man in the Iron Mask**, *The* I-147

**Manioc** (*mān'i-ōk*), or cassava, plant from which tapioca is obtained T-10, *picture* S-205c

**Man'iple**, in Roman Legion A-307f

**Manisa** (*mā'nē-sā*), also **Manissa**, city in w. Turkey 20 mi. n.e. of Smyrna; pop. 31,000; ancient Magnesia, where Roman consul Scipio Asiaticus defeated Antiochus the Great 190 B.C.: map E-326e

**Manistee**, Mich., shipping port on Manistee River and Lake Michigan,

95 mi. n.w. of Grand Rapids; pop. 8694; large salt plant and lumber interests; chemicals, paper, clothing, iron products: map M-153

**Manito'ba**, prairie province of western Canada; 246,512 sq. mi.; pop. 711,216; cap. Winnipeg: M-54-5, map C-50b-c  
 prairies C-50  
 Red River R-62  
 Riding Mountain Park N-23  
 Winnipeg W-114

**Manitoba**, Lake, in s. cent. Manitoba, Canada; length 110 mi.; drains into Lake Winnipeg through Dauphin River: map C-50b  
 Indian legend M-54

**Manitoba**, University of, at Winnipeg, Manitoba; established 1877; arts and science, engineering, medicine, pharmacy, law; Manitoba Agricultural College; several affiliated denominational colleges.

**Manitou** (*mān'i-tō*), or **Manito**, Indian name for certain unknown powers I-64

**Manitou'lin**, rugged island of Ontario, Canada, in Georgian Bay, Lake Huron; 80 mi. long: map G-147

**Manitou Springs**, Colo., health and pleasure resort at foot of Pikes Peak; pop. 1462; entrance to Garden of the Gods and Cave of the Winds; medicinal springs.

**Manitowoc**, Wis., industrial city and port on Lake Michigan, 74 mi. n. of Milwaukee; pop. 24,404; aluminum, boilers, furniture, cement, wood products; large shipbuilding yards: map W-124  
 car ferry M-155

**Maniu** (*mā-nē-yō'*), **Julius** (born 1873), Rumanian statesman; professor of law before 1st World War; organized revolts in Transylvania at close of war; elected head of local government of Transylvania after its union with Rumania; chief of Peasants' party; premier 1928-April 1931, Oct. 1931-1933.

**Manka'to**, Minn., city with large stone-quarrying interests, 72 mi. s.w. of St. Paul on Minnesota and Blue Earth rivers; center of farming, dairying, and stock-raising district; pop. 15,654; state teachers college; threatened by Sioux uprising 1862: map M-192

**Manley**, John (1733-93), American naval officer, born at Torquay, England; notable services in Revolutionary War when he commanded in turn the *Lee*, the *Hancock*, and the *Hague*.

**Man'lius**, Marcus, Capitolinus, Roman patrician, consul 392 B.C.; saved Capitol from Gauls when aroused by cackling of sacred geese.

**Manlius**, Titus, Imperiosus Torquatus, Roman dictator (353 and 349 B.C.) and consul; received part of name for taking chain (*torques*) from gigantic Gaul whom he slew in single combat; had son slain for disobeying military orders.

**Man-machines** A-384, 386

**Maun**, Gotter (1747-1830), Canadian military engineer, born Kent, England; 1785-91 and 1794-1804 commander of Royal Engineers in Canada; improved fortifications and communications.

**Mann**, Heinrich (born 1871), German novelist; his works, while inferior to those of his brother Thomas, show a feeling for beauty and great power of satire ('Mother Mary'; 'The Little Town'; 'The Royal Woman'; 'Madame Legros', play).

**Mann**, Horace (1796-1859), American

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŷde, fŷll, būrn;



- educator and publicist M-55, *picture* E-178  
influence on education E-178-9
- Mann, Thomas (born 1875), German novelist, born Lübeck, of aristocratic merchant family; master of characterization and literary craftsmanship; leisurely style; ironic touches but with strong human sympathy dominating; won Nobel prize for literature 1929; left Germany because of opposition to Nazis; in U. S. after 1938 ('Death in Venice'; 'Buddenbrooks'; 'The Magic Mountain'; 'Joseph' trilogy; 'Beloved Returns').
- Manna, sweet substance exuded, after incision, from trunk of manna ash tree (*Fraxinus ornus*) and forming commercial product in Sicily; used in medicine. The name manna is also given to similar substances obtained from various plants and trees and also to a desert lichen (*Leccanora esculenta*). The manna referred to in the Bible (Exod. xvi) as the food on which the Israelites lived in the wilderness is now believed to be secretion of tamarisk tree caused by insect puncture.
- Manna gum, a eucalyptus tree E-315
- Mannerheim (*män'nēr-him*) Line, Finland, series of fortifications along Karelian Isthmus, between Gulf of Finland and Lake Ladoga; built by Gustaf Mannerheim (born 1868), commander in chief of Finnish army and active in government of Finland.
- Manners E-310-13. *See* Etiquette
- Mannheim (*män'him*), in Baden, s.w. Germany, chief commercial city on upper Rhine River; pop. 266,000; grand ducal palace covers 15 acres; makes farm machinery; gasoline and electric motors: *map* G-66
- Manning, Henry Edward, Cardinal (1808-92), English High Church leader; became Roman Catholic 1851, and made cardinal 1875; ardent supporter of doctrine of papal infallibility.
- Manning, William Thomas (born 1866), American Episcopal bishop, born England; rector Trinity Parish, New York City, 1908-21; made bishop of New York City 1921.
- Man-of-war fish, a fish (*Nomeus gro-novii*), about three inches long, common in the Gulf of Mexico; seeks refuge among the poison tentacles of large jelly-fish, particularly of Portuguese man-of-war.
- Manometer (*mā-nōm'-ē-ter*), instrument for measuring pressure of air, gases, or vapors; barometer one type: V-268
- Manometric flame, a device for detecting sound S-196
- 'Manon' (*mā-nōn'*), opera by Massenet, story O-231
- 'Manon Lescaut' (*mā-nōn lēs-kō'*), opera by Puccini, story O-231
- Manor, in feudal times, the estate of a lord F-29, *picture* A-59
- Manor house, England A-270, *picture* E-276
- Man o' War, famous race horse, *picture* H-343
- Man-o'-war bird, or frigate-bird F-206
- Manpower, problem in 2d World War N-12d, i-j, k-l, r
- Manpower Commission, War (WMC) R-146p, N-12c, j
- U.S. Employment Service U-231
- Mansard roof, one with four sloping sides, each slope broken into two pitches; also called curb roof.
- Mansart, or Mansard (*män-sär'*), Jules - Hardouin (1646?-1708), French architect among whose notable achievements are the dome of the Invalides and the Place Vendôme, Paris; at Versailles, the palace (in large part), gardens, and Grand Trianon. He was a grand nephew of François Mansart (1598-1666) for whom the Mansard roof was named.
- Mansfield Katherine (1888-1923) (Mrs. J. Middleton Murry), British writer of short stories, born Wellington, New Zealand; reveals human character with penetrating insight through ordinary actions and situations; artistic craftsmanship ('Bliss'; 'The Garden Party': E-288, *picture* E-289)
- Mansfield, Richard (1857-1907), American actor, born in Berlin, Germany, while his mother, a singer, was on an opera tour; first rôles were light opera in London; began stage career in America 1878; technique made him successful in wide variety of parts ('Beau Brummel'; 'Dr. Jekyll and Mr. Hyde'; 'Peer Gynt'; 'Cyrano de Bergerac'; and Shakespearean rôles); first to stage Shaw's plays in America.
- Mansfield, England, town in Nottinghamshire, 49 mi. s.e. of Manchester; pop. 48,000; center of coal-mining district; manufactures lace, thread, boots; surrounded by remains of Sherwood Forest.
- Mansfield, Ohio, industrial city 65 mi. s.w. of Cleveland; pop. 37,154; steel and brass goods, farm machinery, stoves, auto tires; large trade in farm products: *map* O-210
- War of 1812 A-232
- Mansfield, Mount, in Green Mts., highest point in Vermont, 4393 ft., *map* N-86
- "Man's first disobedience," quotation from Milton M-179
- Manship, Paul (born 1885), American sculptor, born St. Paul, Minn.; studied in America and Rome ('Dancer and Gazelles'; 'Indian and Pronghorn Antelope'; portrait bust of Rockefeller): S-64, *pictures* F-42
- Mansion House, London residence of lord mayor L-186
- Man slaughter, in law, the unlawful killing of a human being without malice or premeditation, distinguished from murder (or murder in the first degree) which requires malicious intent.
- Manson, Sir Patrick (1844-1922), English physician, pioneer in tropical medicine.
- Mansûra (*män-sq'ra*), Egypt, town on Nile delta 70 mi. n. of Cairo; pop. 69,000; cotton trade and manufactures; battle between Crusaders under Louis IX of France and Egyptians 1250; Louis imprisoned.
- Manta, or devil-fish S-154
- Mantegna (*män-tän'yä*), Andrea (1431-1506), Italian painter ('Triumph of Caesar'; 'Madonna della Vittoria'): P-16
- engraving E-295
- Mantell, Robert (Bruce) (1854-1928), American actor, born in Scotland; especially noted for Shakespearean rôles ('Hamlet'; 'The Merchant of Venice'; 'King Lear'; 'Richelieu').
- Mantineia (*män-ti-nē-ä*), battle of (362 B.C.), between Thebes and Sparta T-78
- Man'tis, an insect M-55
- Mantis'sa, of logarithm P-340-1
- Mantle, the outer fold of tissue that envelops the body and lines the shell of a mollusk; secreting glands in mantle produce the shell: M-218
- cuttlefish C-415
- nautilus N-44
- oyster O-264, *picture* O-265
- squid, *picture* C-416
- Mantle, gas G-23
- Mantled baboon M-230
- Mantua (*män'tyü-ä*), Italian Mantova (*män'tō-vä*), fortified town in n. Italy 80 mi. s.w. of Venice; pop. 44,000; home of Vergil; held by French 1797-99, 1801-14, by Austria 1814-66
- Napoleon captures (1797) N-7
- Man'u, the "Adam" of Hindu mythology; also traditional author of ancient Hindu lawbook
- studied in Hindu schools E-167
- Manua (*mā-nū-ä*) Islands, group of islands, Tau, Ofu, and Olosega, belonging to American Samoa; acquired 1900; 22 sq. mi.; pop. 2597: *map* P-10b-c
- Man'ual, organ O-248-50
- Manual arts M-55, *Outline* I-78. *See also in Index* Home economics; Industrial arts
- Manuel (*mā-nū-ēl'*) II (1889-1932), king of Portugal, succeeded 1908; deposed and banished 1910 when Portugal became a republic
- palace, *picture* P-312
- Revolution of 1910 L-156
- Manuel, Don Juan. *See in Index* Juan Manuel, Don
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- Manutius (*mā-nū'shī-üs*), Italian family of printers, of whom most noted were the founder Aldus, his son Paul (1512-74), famous for his editions of Cicero, and his grand-

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); π=German guttural ch

- son Aldus Junior (1547-97). See in Index Aldus Manutius
- 'Man Without a Country, The', by Edward Everett Hale, called a "parable of patriotism" H-199
- Manx, a Celtic language C-124
- Manx cat, tailless species of Isle of Man C-96
- Manyplies (*mēn'i-pliz*), or omasum, third stomach of ruminants R-176
- Manzanillo (*mān-sā-nē'yō*), Cuba, seaport on Caribbean Sea; pop. 25,000; exports sugar and tobacco: map N-150c
- Manzanillo, Mexico, port on Pacific coast; pop. 10,000; comparatively recent development; railroad connection with interior; growing foreign trade: M-134, map M-133
- Manzanita (*mān-zā-nē'tā*), evergreen shrub (*Ericaceae arctostaphylos*) of the heath family, especially common on Pacific coast of the United States; 3 to 12 ft. high; dark red, smooth bark; white or pink flowers; red berry-like fruit; several species used in ornamental gardening.
- Manzikert, or Melazkerd, town in ancient Armenia; scene of battle (1071) in which Seljuk Turks defeated Romanus Diogenes, emperor of the Eastern Roman Empire; battle opened Armenia and Asia Minor to Turkish inroads.
- Manzoni (*mānt-sō'nē*), Alessandro (1785-1873), Italian poet and novelist; 'I Promessi Sposi' (The Betrothed) called "best historical novel ever written": I-154, N-183
- 'Manzoni Requiem', by Verdi V-282
- Maoris (*mā'ō-riz*), the people of New Zealand N-136, picture N-135
- Maple M-56
- furniture M-56; gumwood used as imitation G-188
- seeds, picture S-74
- sugar maple tree M-56, pictures T-132, 134; leaf, pictures T-135, M-56; seeds, picture M-56
- Maple family, or Aceraceae (*ās-ēr-ā'sē-ē*), a family of trees and shrubs, native chiefly to the Northern Hemisphere, including sugar, or hard, maple, the sycamore of England, Norway maple, and box elder.
- Maple Leaf, Land of the, name applied to Canada.
- 'Maple Leaf Forever, The', Canadian national song by A. Muir.
- Maple sugar and syrup M-57
- Indian sugar basket, picture I-61
- producing regions M-57
- Maplewood, Mo., residential suburb of St. Louis; pop. 12,875.
- Map making M-58-9, A-142
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- World War, second W-178p, q
- Wyoming W-194
- Marabou (*mār'ā-bō*), or adjutant stork S-294
- Marabouts (*mār'ā-byts*), Mohammedan holy men, thought by n. Africa Berbers to work miracles; also name of their tombs.
- Maracaibo (*mā-rā-ki'bō*), one of chief ports of Venezuela, in n.w. on channel between Gulf of Venezuela and Lake Maracaibo; pop. 110,000; exports petroleum, coffee, cacao, hides, cabinet and dye woods: V-275, map V-276
- climate S-208e
- Maracaibo, Gulf of, or Venezuela, Gulf of, inlet of Caribbean Sea in n.w. Venezuela: map V-276
- Maracaibo, Lake, in n.w. Venezuela opening into Gulf of Venezuela; s. half of lake is fresh, but n. half, under tidal influence, is brackish: V-275, map V-276
- lake dwellings, picture S-111
- oil field V-276, picture V-277

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce. bīt; rōw, wōn, fōr, nōt, dō; cūre, bāt, rȳde, fȳll, bȳrn;

Marajo (*mā-rū'hō*), or Joannes, island formed by the estuaries of the Amazon and Para rivers in n.e. Brazil: map B-226

Maranhão (*mā-rān-yōū'*), state on n. coast of Brazil; 177,515 sq. mi.; pop. 1,140,000; cap. São Luiz de Maranhão; cotton, wax, manioc, oil, nuts, live stock.

Maranhão, São Luiz de, Brazil, also Maranhão, capital of Maranhão state, on island of Maranhão: pop. 60,000: map S-208b

Marañon (*mā-rān-yōū'*) River, in Peru, upper course of Amazon A-139, map S-208b

Maraschino (*mār-ā-skē'nō*) cherries C-182

Marat (*mā-rā'*), Jean Paul (1743-93), French revolutionist M-59-60

Marathas. See in Index Mahrattas

Mar'athon, battle of M-60, P-135

Aristides' part A-283

Pan legend P-40

Theseus legend T-79

Marathon race M-60

Maratta (*mā-rāt'tā*), Carlo, or Maratti (1625-1713), Italian painter; patronized by five popes; noted for Madonnas, Holy Families; also 'Constantine Destroying the Idols' painted for Lateran baptistery.

Marble M-60-1

artificial C-128

Carrara I-164, M-61

quarrying Q-1-3, pictures Q-2, M-60

Rutland V-287

United States supply M-61: Georgia

G-56; Tennessee T-46; Vermont

V-287

'Marble Faun', romance by Hawthorne

G-166

Longfellow's comment L-193

Marblehead, Mass., city on Atlantic coast, 16 mi. n.e. of Boston; pop. 10,856; settled by fishermen in 1629, incorporated in 1649; extensive fisheries in colonial times; shoe manufacturing and other industries since middle of 19th century; yachting center; summer resort.

Marbles, small balls of marble (also of agate, glass, or clay) used by children as playthings. The game is of extremely ancient origin and common to all peoples. Common marbles formerly manufactured in Saxony and agates in Oberstein, Germany. Most common marbles now made in the U.S., onyx marbles in Ohio, and agates in New Jersey.

Marbling, in book binding B-187

Marburg (*mār'burk*), Germany, town in Prussian province of Hesse-Nassau, famous for university (founded 1527, first university established without papal privileges); 18th century church containing tomb of St. Elizabeth of Hungary, and 13th century castle.

Marbury vs. Madison, in U.S. constitutional law M-71, U-211

Marbut, Curtis Fletcher (1863-1935), American geologist and soil chemist, born Lawrence County, Mo.; director of Soils Survey, U.S. Department of Agriculture 1910-35: S-191b

Marc, Franz (1880-1916), German expressionist painter, born Munich; used animals as motives in cubistic paintings; decorative color sense; killed in battle at Verdun.

Marcantonio, (1488?-1527?), foremost Italian engraver in the Renaissance, first to copy on copper the work of other artists (Dürer's 'Little Passion' and 'Life of the Virgin'; countless drawings and paintings by Raphael).

Marcasite (*mār'kā-sit*), a mineral used as a gem stone; mined in Bohemia, Saxony, Hungary; in the U. S. in New York, Connecticut, Massachusetts: G-28, M-182

Marcell'us, Marcus Claudius (268?-208 B.C.), a Roman general in 2d Punic War, conqueror of Syracuse; five times consul; killed near Venusia.

March, Francis A. (1825-1911), American philologist and author, born Millbury, Mass. ('Method of Philological Study of the English Language').

March, Peyton Conway (born 1864), American general M-61

March, month M-61

birthdays of famous persons. See in Index Anniversaries and birthdays, table

birth stone G-25

holidays H-320, 322

named from Mars M-70

Marches, The, territorial division on e. coast of central Italy, formerly part of Papal States.

Marchesi (*mār'kē'sē*), Mathilde (née Graumann) (1826-1913), German-French teacher of singing, born Frankfurt; married Salvatore Marchesi, Italian barytone; pupils include Melba, Eames, Calvé.

March Field, U. S. Army Air Corps field 10 mi. s.e. of Riverside, Calif.; established 1917.

'Marching through Georgia', American Civil War song by H. C. Work.

Marco Bozzar'is. See in Index Bozzaris

Marco'ni, Guglielmo (1874-1937), an Italian electrical engineer, inventor of wireless telegraphy M-61-2

early wireless system R-27, M-61-2

Marconi rig, on a sailboat, picture B-164

Marco Polo (1254?-1324), Venetian traveler P-298

visits Hangchow, China H-210

Marco Polo sheep, or Ovis poli S-105, E-346

Marcos de Niza, Fray (*mār'kōs dā nē'thā*), Franciscan friar, chosen to explore region of fabled wealth n. of Sonora, Mexico; penetrated to Zuñi, N.M. ('Seven Cities of Cibola'): A-290, N-99

Marcus, Siegfried (1831-99), Austrian mechanic and inventor, pioneer automobile builder A-388

automobile, picture A-389

Marcus Anton'ius. See in Index Antony, Mark

Mar'cus Aure'lius Anton'ius (121-180 A.D.), Roman emperor M-62-3, R-136

statue in Rome R-138

Marcus Island, in Pacific Ocean, 1150 mi. s.e. of Japan; supply base and link between other Japanese-held islands: map P-10b

Marcy, William Learned (1786-1857), American statesman, born Southbridge, Mass.; prominent in 'Albany Regency'; author of phrase "To the victors belong the spoils"; secretary of state (1853-57).

Marcy, Mount, in n.e. New York, highest peak of Adirondacks and highest point in state (5344 ft.) A-21, map N-114

Marden, Orison Swett (1850?-1924), American author and editor, born Thornton, N.H.; founded and edited *Success Magazine*; won unusual popularity for his success books ('Pushing to the Front'; 'The Secret of Achievement'; 'The Hour of Opportunity'; 'An Iron Will').

Mardi Gras (*mār'dē grā*), or Shrove Tuesday E-140, H-321

New Orleans N-102, picture L-207

Mare, an adult female horse H-345

Mare clausum (*mār'ē claus'um*), in international law, sea or portion of sea under jurisdiction of one nation instead of open to all

Bering Sea controversy H-230

Mare (*mār*) Island Navy Yard, in Calif. at e. end of San Pablo Bay, opposite Vallejo; established 1854 by Farragut; builds all classes of naval vessels; repairs cruisers, auxiliaries, and smaller craft

time signals U-226

Maremma, marshy region of Tuscany

reclamation I-160

Maren'go, battle of (1800), fought near village of this name in n. Italy

35 mi. n.w. of Genoa: N-8

Napoleon's horse named for H-343

Marey, Etienne Jules (1830-1904), French physiologist; devised photographic methods of recording wing motion of insects and birds

photographic gun M-290

Margaret, Saint (1045?-93), queen of Malcolm III of Scotland and daughter of Edward the Exile of England, son of Edmund Ironside; probably born in Hungary; canonized 1251 because of her benefactions; festival in Roman Catholic church June 10, in Anglican July 20.

Margaret (1553-1412), 'Semiramis of the North,' queen (governing as regent for nominal sovereigns) of Denmark, Norway, and Sweden union of Kalmar D-53

Margaret, of Anjou (*mā-zhō'*) (1430-82), queen of Henry VI of England; died in exile

Wars of the Roses R-156

Margaret, of Valois (*vāl-vā'*), or Angoulême (*ān-gō-lēm'*) (1492-1549), queen of Henry d'Albert, king of Navarre, and sister of Francis I of France, joint author of the 'Hep-tameron' stories modeled on the 'Decameron' of Boccaccio; patroness of Marot and other literary men, and protector of Protestants; some times called Margaret of Navarre to avoid confusion with her grand-niece, the daughter of Henry II.

Margaret, of Valois (1533-1615), daughter of Henry II of France and Catherine de' Medici, married to Henry of Navarre (afterward Henry IV of France) on eve of Massacre of St. Bartholomew.

Margaret, or Gretchen, in Faust legends F-20

'Margaret Ogilvy', by Barrie B-51

Margarine (*mār'gā-rēn*), or oleomargarine, a butter substitute O-221-3

Margarita (*mār'gā-rē'tā*), Saint. See in Index Rita

Margarita, Venezuelan island in Caribbean Sea; 444 sq. mi.; pop. 73,000; cap. La Asunción; pearl fisheries; discovered by Columbus 1498: map S-208b

Mar'gate, England, popular summer resort on North Sea 65 mi. e. of London; pop. 31,000.

Marggraf (*mār'g'gräf*), Andreas Sigismund (1709-82), German chemist; discovered sugar in beetroot; valuable observations on phosphoric acid; introduced microscope in chemical investigations.

Marghera, Italy, port of Venice V-279

Mar'gin, in speculation B-161, S-292

Marginal belt, of a nation I-109

Marginal land, in agricultural economics, land which yields crops barely equal in market value to the cost of cultivation.



**Marguerite** (*mär-jê-rêt*), popular name of several flowers of the aster family, such as the China aster, common garden daisy, oxeye daisy; also some cultivated species of chrysanthemum

golden, how to plant G-10  
pollen grain, *picture* F-125

**Margueritte** (*mär-jû-rêt*), Paul (1860-1918), and Victor (1866-1942), French novelists, brothers, born in Algeria; collaborated in series of novels known under title 'Une Époque' (1898-1904); after 1st World War, Victor caused sensation with 'La Garçonne', 'Les Coupables', 'Appel aux Consciences'.

**Maria**, in Shakespeare's 'Twelfth Night', Olivia's pert, clever maid.

**Maria II, da Gloria** (1819-53), queen of Portugal; succeeded 1827 on abdication of her father, Pedro I; reign troubled by rebellion of her uncle, Don Miguel, and factional insurrections.

**Maria Christina** (1858-1929), queen mother of Spain, daughter of Archduke Karl Ferdinand of Austria; left convent, of which she was abbess, to marry Alfonso XII; ruled as queen regent from his death (1885) until Alfonso XIII became of age in 1902.

**Marlager** (*mä-rê-ä-jêr*), small seaport of Denmark, in Jutland, 35 mi. n. of Aarhus.

**Marianas** (*mä-rî-ä-näs*) Islands, also Ladrone Islands, group of 15 islands in Micronesia, Pacific Ocean, 1500 mi. e. of Philippines; 450 sq. mi.; made Japanese mandate 1919 (except Guam, ceded to U.S. 1898); island of Saipan, cap. of mandate, is Japanese naval base; sugar, copra; bonito fisheries: G-181, J-186, *map* P-100

**Mariánské Lázně**. See **Marientbad**  
**Maria Theresa** (*mä-rê-ä té-rä-sä*) (1717-80), archduchess of Austria, and queen of Hungary and Bohemia M-63

Francis I, emperor, husband of F-186  
Seven Years' War S-84

**Maria Theresa** (1638-83), of Spain, queen of Louis XIV  
Madame de Maintenon aids M-41  
wedding ceremonies V-274

**Maria-Theresiopel** (*mä-rê-ä té-rê-zê-ô-pêl*), Yugoslavia, also Subotica, city 100 mi. n.w. of Belgrade; pop. 100,000; agricultural center; linens, shoes.

**Maricopa** (*mä-rê-kô-pä*), a Yuman tribe of Indians affiliated with the Pima in s. Arizona I-55

**Marie** (1875-1938), queen of Ferdinand I of Rumania; born England, eldest daughter of Duke of Edinburgh, second son of Queen Victoria; married Prince Ferdinand, later king 1893; active in Red Cross work during 1st World War and in traveling and writing ('The Lily of Life', 'My Country', 'Ilderim'); for many years exercised strong influence in Rumanian politics; mother of Carol II: R-176

**Marie Antoinette** (*mä-rê äh-twä-nêt*) (1755-93), queen of Louis XVI M-64, F-202

imprisoned in Temple, *picture* F-201  
influence on Louis XVI L-202

Petit Trianon at Versailles V-289  
**Marie Byrd Land** P-286, *map* A-215

**Marie de France** (*mä-rê dü fräns*), French poetess of 12th century; lived in England, for a time at court of Henry II; wrote narrative poems and fables.

**Marie de l'Incarnation** (1599-1672), French Roman Catholic nun, born

Tours; 1639 went to Canada with Madame de la Peltrie to found Ursuline convent at Quebec; first superior of convent.

**Marie Galante** (*jâ-lâht*), an island of French West Indies, s.e. of Guadeloupe, of which it is a dependency; 60 sq. mi.; pop. 23,000.

**Marie Louise** (1791-1847), 2d wife of Napoleon I; daughter of Emperor Francis I of Austria N-9, 10, *picture* N-7

**Marientbad** (*mä-rê-ên-büt*), Czech Mariánské Lázně (*mär'yân-skâ lâz'nyê*), Germany, formerly in Czechoslovakia, celebrated watering place near w. border of Bohemia; pop. 7000; mineral springs.

**Marienburg** (*mä-rê-ên-burk*), Germany, city in East Prussia on Nogat River 30 mi. s.e. of Danzig; pop. 25,000; machinery, cotton, and lumber manufactures; old castle, founded in 13th century, seat of Teutonic knights (1309-1457); historic 14th century town hall.

**Marie Thérèse Charlotte**, daughter of Louis XVI, *picture* F-201

**Marietta**, Ohio, on Ohio and Muskingum rivers; pop. 14,543; large river trade; furniture, paints, steel safes, concrete products; truck gardening, sandstone quarrying, and cattle raising; Marietta College; named for Marie Antoinette: *map* O-210

first settlement in state O-214

**Marietta College**, at Marietta, Ohio; founded 1797 as an academy, college charter 1835; liberal arts.

**Mariette** (*mä-rê-êt*), Auguste Edouard (1821-81), French Egyptologist; author of several books about his explorations and discoveries.

**Marignac** (*mä-rê-nyâk*), Jean Charles de (1817-94), Swiss chemist, discoverer of ytterbium and gadolinium.

**Marignano** (*mä-rên-yâ-nô*), Italy, also Melegnano, town in n. Italy 10 mi. s.e. of Milan; scene of victory of Francis I of France over Swiss allies of Milan (1515).

**Mar'igold**, a plant of the aster family M-64

marsh M-71

Tetra P-245f

**Marigold**, flg. See **Fig marigold**

**Marihuana** (*mä-rê-wâ-nâ*), or hashish, a narcotic drug H-272, N-12

**Marim'ba**, a musical instrument

African, *picture* M-309

Latin American, *picture* L-671

**Marin**, John (born 1870), painter, born Rutherford, N.J.; distinguished water colorist; favorite subjects New York City's skyscrapers, boats, and scenes in Maine; faultless composition, simplicity in form and pattern, fluid and radiant color.

**Marina**, Cortez' interpreter C-372

**Marina Fall**, British Guiana, on the Ipobe River; 500 ft. high; discovered 1934.

**Marine Band**, U.S., founded 1798 in Philadelphia by the Congress of the United States as a part of the U.S. Marine Corps; in 1800 headquarters removed to Washington, D.C.; oldest American military band; 1899 organized a symphony orchestra; plays at White House receptions, inaugurations.

**Marine barometer**, or Kew barometer B-50

**Marine charts** N-49

**Marine climate**, or ocean climate

C-270a, O-200-1, E-316

**Marine Corps**, British M-65

**Marine Corps**, U. S. M-65, N-51

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World War, 1st B-94, C-155

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Marine engineering, defined E-267

Marine Inspection and Navigation, Bureau of U-227

Marine insurance I-94

Marineland, Fla., 17 mi. s. of St.

Augustine, on Atlantic Ocean

Marine Studios, *picture* A-234

Marine life O-198-200, B-114, *pictures* O-195, 197, 199

oceanarium, *picture* A-234

Marinera (*mä-rê-nä-rä*), a dance L-67k

Mariner's compass. See **Compass**

Mariners' measure, *table* W-67

**Marinette** (*mär-i-nêt*), Wis., shipping port on Green Bay at mouth of Menominee River; pop. 14,183; knit goods, lumber products, paper, cutlery; fishing: *map* W-124

**Marinetti** (*mär-ê-nê-tê*), Filippo Tommaso (born 1878), Italian poet, playwright, and essayist; leader of Futurist movement in literature and painting in Italy.

**Marinus** (*mä-rê-nyngs*), Saint, legendary founder of republic of San Marino I-162

**Mar'ion**, Francis (1732-95), American Revolutionary soldier M-65

**Marion**, Ind., manufacturing town 60 mi. n.e. of Indianapolis; pop. 26,767; auto trucks, paper products, glass, foundry products, machinery; Marion College: *map* I-46

**Marion**, Ohio, industrial city 46 mi. n. of Columbus in agricultural district; pop. 30,817; steam shovels, tractors, automobile parts, glass: *map* O-210

**Marionettes** P-368b, c. See also in *Index* Puppets  
books about making H-313n

**Mariotte** (*mä-rê-ôt*), Edmé (1620?-84), French physicist, independent discoverer of law usually called Boyle's law G-18

**Maripo'sa Grove**, Calif., a grove of sequoia trees, part of Yosemite National Park S-80

**Mariposa lily**. See in *Index* Sego lily  
**Maris**, Jacob (1837-1899), Dutch painter, born at The Hague; distinguished for his luminous yet misty paintings of Holland landscapes. His brothers, Matthew (1839-1917) and William (1843-1910), who moved to London, were also artists of note.

**Maritime Andes**, or Caribbean Hills, Venezuela V-275

**Maritime Commission**, United States (USMC) R-146g, S-129, N-12e, h  
vessel, *picture* S-120

**Maritime Day** H-320

**Maritime Labor Board** (MLB) R-146g

**Maritime Provinces**, Canada C-50

occupations, *pictograph* C-50a

**Marit'za River**, in Balkan Peninsula; about 300 mi. long; empties into Aegean Sea: *map* B-18

**Marius** (*mä-rê-üs*), lover of Cosette in Victor Hugo's novel 'Les Misérables' H-354

**Marius**, Gaius (155?-86 B.C.), Roman general R-134  
Pompey opposes P-302

**Marivaux** (*mä-rê-vô*), Pierre Carlet de Chamblain de (1688-1763), French writer; had great influence on development of French comedy

Key—câpe, ât, fär, fâst, whät, fâll; mē, yēt, fērñ, thêre; ice, bīt; rōw, wōn, fōr, nōt, dā; cûre, bût, ryde, fûll, bûrn;

- and novel; his clever, often affected style became known as *marivaudage* ('Les fausses Confidences', 'Le Legs', plays; 'Marianne', an unfinished but important novel).
- Mar'joram, an herb of the mint family S-250, 251 as a dye S-249
- Marjoram, sweet, a perennial herb (*Majorana hortensis*) of the mint family, native to Europe; grows to 2 ft.; leaves oval, grayish green; flowers, purple or white, in oblong spikes; used in medicine, and leaves used as a seasoning in foods; usually grown as an annual plant because easily killed by cold: S-250
- Mark, Saint, traditional author of the Second Gospel; festival April 25: A-229-30
- Mark, Gospel of Saint A-229-30
- Mark, the monetary unit of Germany from 1873 to 1924; replaced by reichsmark of same nominal value, 23.8 cents; later nominally worth about 24 cents. The "aski" mark is not a coin, but a German bank credit given in payment for imports from certain countries and can be used only to buy German goods. Also an Anglo-Saxon money of account (\$3.23) and an old Scottish coin (27 cents).
- Mark Antony. *See in Index* Antony, Mark
- Mar'ken, Netherlands, village formerly on island before draining of Zuider Zee N-69, map B-87 interior of home, and costume, *picture* N-67
- Market, an assembly place for the exchange or sale of goods or securities; also the general demand for goods of any particular type. *See also in Index* Fairs; Marketing boards of trade B-160-1
- Bruges' Market Hall, *picture* B-253
- Cairo bazaar C-15-16
- Chicago: Board of Trade B-160, E-151-2; produce, *picture* F-140; Maxwell Street, *picture* C-192
- commodity exchanges E-151-2
- Cracow, Poland C-390
- Damascus bazaar D-9
- Delhi bazaar D-42-3
- Greece, ancient, *picture* A-283
- Guatemala G-181b, *picture* G-181a
- medieval R-76: fairs F-3
- Mexico M-137
- modern trade fairs F-3-4
- Peking bazaar F-102
- Tunis meat market, *picture* F-142
- Market gardening. *See* Truck farming
- Marketing, the process of distributing and selling goods and services E-151-2. *See also in Index* Commerce; Market; Transportation
- advertising helps A-23-4
- agricultural A-56-8: commodity exchanges B-160-1, E-151-2; Federal agencies F-12, H-336, U-230
- chain stores C-137-137a
- coöperative movement C-355-6, A-56: Denmark A-57-8, D-52; fruit F-212-13
- cotton marketing C-376, 378, 380
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- exporting F-143
- grain marketing B-160-1, E-151-2
- instalment buying and selling I-93
- international trade I-110-12, C-321-3, C-273-5: tariff T-13-14
- live stock M-98, *pictures* M-96-7, C-188
- stock exchanges E-150
- surplus crops, government control A-56b-57, U-230
- trusts and cartels T-146, 147
- Marketing agreement, or cartel T-147
- Market price, of stocks S-290
- Markévitch (*mär-kyä'vech*), Igor (born 1912), Russian composer, born Kiev; studied in Paris; his highly individual style aroused much controversy among critics ('Concerto Grosso'; 'Paradise Lost', cantata).
- Mark'ham, Sir Clements (1830-1916), English geographer, for more than 60 years an active explorer and supporter of explorations by others; funds for Scott's South Polar voyage raised almost entirely by his efforts.
- Markham, Edwin (1852-1940), American poet, born Oregon City, Ore.; herded cattle and sheep on a California ranch in youth; school principal and superintendent in California until 1899, when he turned entire attention to writing and lecturing ('The Man with the Hoe, and Other Poems'; 'Lincoln, and Other Poems'; 'The Ballad of the Gallows Bird'; 'The Children in Bondage', a book on child labor).
- Markham, William (1635?-1704), English colonial governor, cousin of William Penn; not a Quaker himself although he led first band of Quakers to Pennsylvania preceding William Penn: P-116
- Mar'khor ('snake-eater'), large wild goat (*Capra falconeri*) of the Himalaya Mts. with spirally twisted horns and long shaggy coat.
- Mark'ka, the monetary unit of Finland, nominally worth about 2½ cents; formerly coined with a value of 19.3 cents.
- Markoe, Abraham (1729-1806), Danish merchant of Philadelphia, born in Danish West Indies (Virgin Islands); formed troop to fight in Revolutionary War
- originator of Philadelphia Light Horse flag F-98, *color plate* F-90
- Mark Twain. *See in Index* Twain, Mark
- Marl, impure limestone M-182
- greensand, in New Jersey N-92
- Marl'borough, John Churchill, first Duke of (1650-1722), English general and statesman M-65, 66, A-211
- Swift attacks S-843
- Marlborough, Sarah Jennings Churchill, Duchess of (1660-1744), favorite of Queen Anne M-65, 66
- Marlborough, Mass., boot and shoe manufacturing city 28 mi. w. of Boston; pop. 15,154; nearly destroyed by Indians in King Philip's War (1676).
- Marlin, Tex., health resort 25 mi. s.e. of Waco; pop. 6542; mineral water wells; famous baths, sanatoriums, clinics; manufacture of mineral crystals.
- Marlin, any of several large salt-water fish related to sailfish and spearfish; family *Istiophoridae*, genus *Makaira*; popular deep-water game fish of Hawaii, Japan, California, Mexico, West Indies, and Florida north to Cape Cod; often taken with harpoon.
- Marline-spike. *See in Index* Navigation, list of terms
- Marlowe (*mär'lö*), Christopher (1564-93), great English poet and dramatist; "father of English tragedy" and of English blank verse; "most daring and inspired pioneer in all our poetic literature" ('Tamburlaine'; 'Doctor Faustus'; 'The Jew of Malta')
- basis of 'Tamburlaine' M-224
- influence on Shakespeare S-100b, f
- Marlowe, Julia (born 1870), American Shakespearean actress, born England; starred with Sothern, whom she married: *picture* D-97
- Mar'mara, Sea of, also Marmora, ancient Propontis, sea between European and Asiatic Turkey; area 3200 sq. mi.; mean depth 1027 ft.: map E-326e
- 'Marmion: a Tale of Flodden Field', poem by Sir Walter Scott telling of the adventures and futile love for Lady Clare of Lord Marmion, leader of the Scots, who was finally slain at Flodden Field; contains the ballad of 'Young Lochinvar': S-49
- Märmol (*mär'möl*), José (1818-71), Argentine novelist L-67t
- Marmolata (*mär-mö-lü'tä*), highest peak of the Dolomites (10,972 ft.).
- Marmora, Sea of. *See in Index* Mar-mara, Sea of
- Mar'moset, a small South American monkey of *Hapalidae* family M-228, *picture* M-227
- Mar'mot, a genus of rodents, belonging to the ground squirrel group, particularly the Alpine marmot (*Arctomys marmotta*)
- groundhog G-179
- prairie-dog F-342
- Marne (*märn*) River, in n.e. France; scene of two decisive battles of 1st World War and of severe fighting in 1940 in 2d World War M-66-7. *See also in Index* Chateau-Thierry
- first battle M-66-7, W-154: Foch F-131; Joffre J-221
- second battle M-67, W-164: American divisions M-67
- Mar'onites, a Christian sect of Syria S-362
- Maronobu (*mä'rö'nö'bq'*) (1625-94), Japanese painter, noted chiefly for skillful and powerful paintings of actors and beautiful women; first Japanese painter to make designs for wood-block prints.
- Marot (*mä-rö*), Clément (1495?-1544), French poet; introduced new grace and ease into stiff forms of French poetry (translation of Psalms: 'L'Adolescence'; 'Clémentine'; 'Blasons').
- Marpes'sa (*mär-pēs'sä*), in Greek mythology, a maiden who was loved by Apollo but preferred her human lover, Idas.
- Marquand, John Phillips (born 1893), novelist, born Wilmington, Del.; travels in China form the background of 'Ming Yellow' and the Mr. Moto stories; 'The Late George Apley', Pulitzer prize novel (1938), 'Wickford Point', and 'So Little Time' are penetrating satires.
- Marque (*märk*), letters of P-222
- Marquesas (*mär-kä'säs*) Islands, French îles Marquises (*el mär-kē'sä*), group of 11 Polynesian volcanic islands in mid-Pacific, belonging to France, 2872 mi. s.w. of Los Angeles, Calif.; 480 sq. mi.: map P-10c
- natives P-5
- Marquess. *See in Index* Marquis
- Marquette (*mär-két'*), Laurent Honoré (1848-1920), French sculptor; statue of Victor Hugo in Sorbonne; many classical subjects
- 'Cupid', *picture* C-414
- Marquetry, or inlaying furniture decoration I-99, 101, 102
- Marquette (*mär-két'*), Jacques (1637-75), French Jesuit missionary and explorer M-67
- explores the Mississippi M-67
- founds Sault Ste. Marie, Mich. S-32
- Illinois River I-12
- Joliet assists J-226, M-67
- Marquette, Mich., summer resort, manufacturing and shipping center on Lake Superior; pop. 15,928;

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch

- large steel and concrete ore docks; mining, lumbering, commercial fishing, railroad shops; state teachers college: *map* M-153
- Marquette Range, an iron range in Michigan, *map* G-147
- Marquette University, at Milwaukee, Wis.; Roman Catholic (Jesuit); founded 1864; organized as a college 1881, as a university 1907; colleges of liberal arts, business administration, engineering, journalism; schools of medicine, speech, dentistry, and law; graduate school.
- Marquis (*mär'kwis*), Don (Donald Robert Perry) (1878-1937), American writer of stories, plays, and verse; born Walnut, Ill.; columnist New York *Evening Sun*; won wide audience for his humorous bits of wisdom ('The Old Soak'; 'Archy and Mehitabel'; 'A Variety of People'; 'Off the Arm').
- Marquis (*mär'kwis* or *mär-kē'*), also marquess, European noble next in rank below a duke; wife is called marquise (*mär-kēz'*) or marchioness (*mär'shin-ēs*): D-34
- Marquissette (*mär-ki-zēt'*), fabric of open, loose weave, of cotton, silk, rayon, wool; used for curtains.
- Marquis of Queensberry rules, for boxing B-208
- Marquis wheat W-82
- Marrakech (*mā-rā'kēsh*), or Marrakesh, formerly Morocco City, one of the chief cities of Morocco, in w.; estimated pop. 190,000; morocco leather manufactures; founded 1072 and reached greatest prosperity about 1300, when population is said to have been 700,000: *map* A-42a
- Marriage M-68-9
- American colonists A-153, 167
- American Indians I-58
- Arabs F-8
- Chinese C-219, 220, 221e, *picture* C-221e
- customs M-69
- divorce M-68: American Indian I-58
- goddess of, Hera, or Juno H-281, J-229
- India I-37
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- monogamy F-8
- polyandry F-8-9
- polygamy F-8, 9. *See also in Index*
- Polygamy
- regulations M-68
- sacrament M-69, C-232
- Zulu customs, *picture* A-35
- Marriage goddess of (Hera) H-281, J-229
- 'Marriage à la Mode', paintings by Hogarth, *pictures* H-317, P-21
- Marriage chest, or cassone colonial A-169
- Italian, *picture* I-98
- 'Marriage of Figaro', opera by Mozart O-231
- Marrow, of bones B-172
- red corpuscles made by B-157a
- Marryat (*mär'i-ät*), Frederick (1792-1848), English naval captain and novelist; own experiences formed background of his many famous sea stories ('Mr. Midshipman Easy'; 'Peter Simple'; 'Snarley-yow, or the Dog Fiend'; 'Masterman Ready' and other boys' stories).
- Mars, Roman god of war, identified with Greek Ares M-70
- statue, *picture* G-166
- Mars, a planet P-230, 231-2, *picture* M-70, *diagrams* P-230, 231, 232, *table* P-231
- "canals," *pictures* P-232
- origin of name M-70
- retrograde motion P-229-30
- satellites (moons) P-232
- Mars, Hill of A-355
- 'Marsellaïse, La' (*lä mär-sé-yéz'*), French national song N-24, M-70
- words of first verse translated N-26
- Marselles (*mär-sälz'*), French Marselle (*mär-sé'yü*), seaport on Mediterranean; 2d city of France; pop. 915,000: M-70
- early trade center C-322
- harbor M-70, *picture* H-215
- soap S-175
- Marsh, George Perkins (1801-82), American diplomat, lawyer, and philologist, born Woodstock, Vt.; member House of Representatives; U.S. minister to Turkey and to Italy ('Lectures on the English Language').
- Marsh, Grant Prince (1834-1916), American steamboat captain, pioneer pilot of the upper Missouri, born Chautauqua County, N.Y.; began career as cabin boy at age of 12; rendered invaluable assistance to armies of Sully, Forsyth, Custer, Terry, and Reno in wars with the Sioux (1864-76).
- Marsh, Reginald (born 1898), American painter, born Paris, France; noted for clever portrayal of New York City life—theater, crowded subways, beaches, Bowery scenes; painted murals for U. S. Postoffice Dept.
- Marsh, a tract of low, wet land. *See in Index* Swamp
- Marshal, title derived from ancient title of masters of horse of Frankish kings; highest military officer in France called "marshal" since 13th century; German Feldmarschall and English Field Marshal derived from it; in United States, ministerial officer of federal courts; also, in certain sections, the town or village policeman.
- Marshall, Archibald (1866-1934), English novelist; pictured the English country gentleman and his family ('The Eldest Son'; 'The Old Order Changeth'; 'The Hall and the Grange').
- Marshall, Charles (born 1886), American operatic tenor, born Auburn, Me.; member Chicago Civic Opera Company; leading rôles in 'Otello', 'Aida', 'Pagliacci', 'William Tell'.
- Marshall, George Catlett (born 1880), army officer, born Uniontown, Pa.; graduated U. S. Infantry-Cavalry School, 1907; service in 1st World War; aide to General Pershing, 1919-24; made general and chief of staff of U. S. Army, 1939: *pictures* W-178o, R-146r
- Marshall, James Wilson (1810-85), American pioneer, born Hunterdon County, N.J.; started on Oregon Trail 1844; took part in Bear Flag Revolt 1846; in 1848, with John Sutter, discovered gold in California, but, like Sutter, did not profit from discovery.
- Marshall, John (1755-1835), chief justice of U.S. Supreme Court M-70-1
- important decisions U-211-12
- Jackson's attitude toward J-179
- Liberty Bell D-29
- 'X Y Z' Affair X-202
- Marshall, Thomas Riley (1854-1925), American statesmen, born North Manchester, Ind.; governor of Indiana 1909-13 ('Recollections; a Hoosier Salad')
- vice-president of U.S., *table* V-392
- Marshall, Tex., industrial city 87 mi. w. of Shreveport, La.; cotton, fruit, vegetable, and live stock interests; pop. 18,410; railroad shops, lumber, car wheels, brick, pottery; natural gas, iron ore, silica sand, clay near
- by; Bishop and Wiley colleges (Negro): *map* T-56
- Marshall College, at Huntington, W. Va.; state institution founded 1837; arts and sciences, education, graduate school.
- Marshall Ford Dam, in Texas, *table* D-357
- Marshall Islands, archipelago made up of Ralik group (11 main islands) and Ratak group (13 main islands) in Micronesia, Pacific Ocean, e. of Caroline Islands and n. of Gilbert Islands; about 160 sq. mi.; came under German rule 1885; made Japanese mandate 1919; Jaluit, cap. of mandate, is Japanese naval base; chief export copra: J-186, *map* P-10b
- king and queen, *picture* P-5
- Marshalltown, Iowa, industrial city 55 mi. n.e. of Des Moines in agricultural and stock-raising district; pop. 19,240; corn-canning plants, railroad shops; gray iron and brass work, furnaces; Iowa State Soldiers' Home: *map* I-120
- Marshall Niel rose (or Marechal Niel rose), named for distinguished French marshal, Adolphe Niel (1802-69), *picture* R-157
- Marshallfield, Wis., city near center in dairy region; pop. 10,359; lumber, box and shoe factories; St. Joseph's Hospital, Wood County Hospital, School for Deaf: *map* W-124
- Marsh gas. *See in Index* Methane
- Marsh-hawk H-246, 247
- quail and B-145
- Marsh mallow, a plant (*Althaea officinalis*) of the mallow family having large, heart-shaped, velvety leaves and clusters of pale rose-colored flowers; roots used for mucilage and in medicine; occasionally the whole plant is eaten.
- Marshmallow, a sweetmeat C-72
- Marsh marigold, plant of buttercup family M-71, *picture* M-64
- Marsh nun, a type of dragon-fly D-88
- Marsh rabbit H-223
- Marsh tortoise T-116
- Marsh-treader, a water-bug, *picture* W-46
- Marsh wren W-181
- Mars-la-Tour (*mär-lä-tör'*), village in n.e. France, 15 mi. w. of Metz; battle (also called Vionville) in Franco-German War (1870) when German brigade was destroyed.
- Marston Moor, plain in Yorkshire, England, 8 mi. from York; battle of (1644): C-400, C-149
- Marsupialia, the order of mammals comprising the marsupials Z-229
- Marsupial mole, a burrowing animal of the family *Notoryctidae*, found in cent. and n.w. Australia; about 6 in. in length; completely blind, as eyes are beneath skin; lives on insects.
- Marsupials, mammals such as kangaroo, with abdominal pouch for carrying young M-44
- America: opossum O-235
- Australia A-372: kangaroo K-1-2; koala, *picture* Z-224
- evolutionary scale K-2, *diagram* A-200
- New Guinea N-83
- reproduction K-2
- Tasmania T-15, *pictures* T-14, 15
- Marsyas (*mär'si-äs*), satyr in Greek mythology A-228
- Martel, Charles (688-741), Frankish ruler, defeated Saracens C-153
- sword used by Joan of Arc J-220
- Marten, an animal of the weasel family M-71-2
- Martha, sister of Lazarus and Mary,

Key—cápe, át, fār, fást, whaf, fǫll; mē, yēt, fērn, thérre; íce, bít; rōw, wón, fōr, nōt, dǫ; cūre, bútt, rýde, fǫll, búrn;



and friend of Jesus (Luke x, 38), commemorated as saint July 29.  
 'Martha', opera by Friedrich von Flotow, story O-231

Marthas Vineyard, summer resort island off s.e. coast of Massachusetts; 23 mi. long: map M-82

Martí (mār-tē'), José Julián (1853-95), patriot and author, born Havana, Cuba; twice imprisoned and deported to Spain for his liberal ideas and writings; escaped to Mexico and U. S. where he wrote propaganda for Cuban independence; 1895 joined Máximo Gómez in revolutionary movement and was killed in battle with Spaniards at Dos Ríos.

Martial (mār'shāl), anglicized name of Marcus Valerius Martialis (40?-104? A.D.), greatest Roman epigrammatist L-69

Martial law L-74, C-386  
 reconstruction, Civil War C-257

Martin, Saint (316-400), bishop of Tours, born in Hungary; a patron saint of France and of cities of Mainz, Würzburg, and Buenos Aires; feast day November 11; founded monastery of Ligugé near Poitiers, France, in 360  
 Martinmas festival H-323

Martin, popes. For list, see in Index Pope, table

Martin, Abraham (1589-1664), Canadian settler, born Scotland; emigrated to Canada 1614; member of Company of New France, he received grant of land on heights of Quebec, later known as Plains of Abraham; remained there after surrender to the English.

Martin, Everett Dean (born 1880), American writer and lecturer on social philosophy and psychology, born Jacksonville, Ill.; formerly Congregational minister; director of Peoples Institute and of Cooper Union Forum, New York; professor of social philosophy, Claremont Colleges, Calif., after 1936; did much to popularize study of psychology ('Psychology'; 'Meaning of a Liberal Education').

Martin, Felix (1804-86), French Jesuit priest, historian, born Auray, France; helped to re-establish Jesuit order in Canada 1842-62; designed St. Patrick's church, Montreal; biographer of French explorers and missionaries; editor of 'Jesuit Relations'.

Martin, George Madden (Mrs. A. R. Martin) (born 1866), American author; born Louisville, Ky.; writer of stories for girls and contributor to magazines on women in politics ('Emmy Lou, Her Book and Heart'; 'Abbie Ann'; 'Warwickshire Lad').

Martin, Glenn L. (born 1886), airplane manufacturer, born Macksburg, Iowa; started building and flying airplanes, 1907; founded Glenn L. Martin Co. to manufacture airplanes, 1911.

Martin, Gregory (died 1582), English scholar, translator of Douai version of Bible B-103

Martin, Helen Reimensnyder (1868-1939), American novelist and short-story writer, born Lancaster, Pa.; graphic stories of Pennsylvania Dutch life ('Tillie, a Mennonite Maid' and 'Barnabette'), both dramatized; 'For a Mess of Pottage'; 'The Snob'; 'Ye That Judge'; 'Sylvia of the Minute').

Martin, Homer (1836-97), American artist, born Albany, N. Y.; usually considered one of the three (Inness, Martin, Wyant) greatest American

landscape painters ('Harp of the Winds'); P-27

Martin, Josiah, governor of North Carolina colony N-159

Martin, Luther (1748?-1826), American lawyer and political leader, born near New Brunswick, N.J.; delegate to the Constitutional Convention at Philadelphia in 1787, but opposed strong central government and did not sign the Constitution; first attorney general of Maryland and served 1778-1805 and 1818-22; defended Aaron Burr in trial for treason (1807).

Martin, Richard (1754-1834), English instigator of anti-cruelty laws H-354

Martin, purple, an insect-eating bird of the swallow family S-332  
 bird houses designed for B-142, picture S-333  
 food habits B-122

Martin du Gard, Roger (born 1881), French author; Nobel prize (1937) for his novel-cycle, 'Les Thibaults', which portrays history of a French family in decade before 1st World War.

Martineau (mār'ti-nō), Harriet (1802-76), English writer; popularized theological speculation of her day; from a Unitarian became an agnostic ('Eastern Life, Present and Past'; 'Illustrations of Political Economy'; 'Society in America').

Martineau, James (1805-1900), English philosopher and Unitarian divine, brother of Harriet Martineau; great influence as preacher in Liverpool and London; professor mental and moral philosophy at Manchester New College ('Endeavors after the Christian Life'; 'Types of Ethical Theory').

Martinelli (mār-tē-nē'lē), Giovanni (born 1885), Italian dramatic tenor; one of leading singers with Metropolitan Opera Company, New York.

Martinez, Peter (1523-65), Spanish Jesuit missionary, born Aragon, Spain; accompanied Spanish expedition to Florida in 1565; said to be first Jesuit to reach North America; killed by Indians.

Martínez Ruiz (mār-tē'nāth rā-ēth'), José ('Azorín') (born 1874), Spanish critic, novelist, and dramatist; a finished and exquisite stylist: S-237, 238

Martínez Sierra (sē-yēr'ā), Gregorio (born 1881), Spanish dramatist and novelist, collaborated with his wife, María de la Lejarraga (born 1880); helped replace old melodramas of Spanish stage with plays of delicacy ('The Cradle Song'; 'The Kingdom of God').

Martini (mār-tē'nē), Giovanni Battista (1706-1784), Italian musician, famous as teacher of composition and writer on musical theory; composed sacred music.

Martini (mār-tē'nē), Simone (sē-mō'nā) (1285?-1344), Italian painter of Sienese school, pupil of Duccio; works highly decorative, influenced by Byzantine tradition; his exquisite surfaces and sinuous line evident in subsequent Sienese painting; best known for frescoes for churches of Assisi, Siena, and Naples.

Martinique (mār-tē-nēk'), island of West Indies; French possession; 385 sq. mi.; pop. 245,000: M-72, maps W-72c, N-150c  
 natives, picture W-72d  
 Saint Pierre and Mont Pelée M-72, picture W-72a

Martinmas, a holiday H-323

Martinsburg, W. Va., industrial city 55 mi. n.w. of Washington, D.C.; pop. 15,063; limestone, clay, shale near by; ships apples; hosiery, woolen goods, brick, cement, flour, apple products; strategic point in Civil War: map W-76

Martins Ferry, Ohio, industrial city on Ohio River almost opposite Wheeling, W. Va.; pop. 14,729; in agricultural, coal, and limestone region; iron and steel products; birthplace of W. D. Howells.

Martinsville, Va., city 40 mi. s. of Roanoke, seat of Henry County; pop. 10,080; furniture plants, knitting and hosiery mills.

Martin Vaz Rocks, island in Atlantic Ocean A-358

Martiny, Philip (1858-1927), American sculptor, born Alsace; did much to refine decorative sculpture in America; works include the sculpture for the grand staircase of the Congressional Library, Washington, D. C.; Soldiers and Sailors Monument, Jersey City, N. J.

Martynia (mār-tin'i-ā), a plant. See in Index Unicorn-plant

Martynia family, or Martyniaceae (mār-tin-i-ā'sē-ē), a family of plants, native to the tropical regions, including the proboscis-flower, or unicorn-plant, and the S. American vegetable escorzonera.

Martyrs M-72

apostles A-229  
 Bunyan under Charles II B-274-5  
 early Christians at Rome R-140  
 English, under Mary I M-73

Marvel, Ik, pen name of Donald G. Mitchell (1822-1908), American author, born Norwich, Conn.; contributed to leading American magazines from 1842 to 1897 ('Reveries of a Bachelor'; 'Dream Life').

Marvell, Andrew (1621-78), English poet and satirist; assistant to Milton as Latin secretary under Cromwell; under Restoration attacked Charles II and advocated a republic; remembered now for his lyrics

quoted on death of Charles I C-149  
 Marvel of Peru. See in Index Four-o'clock

Marx (mārks), Karl (1818-83), German socialist, founder and leader of Marxian socialism M-72-3  
 Communist manifesto C-324d-25

Marx, Wilhelm (born 1863), German politician; entered Reichstag 1910; a leader of Center party of which he became president 1921; chancellor of Reich 1923-24 and 1926-28.

Mary, mother of Jesus J-213-14, M-20.  
 See also in Index Madonna

Mary, sister of Martha and Lazarus (Luke x, 38-42; John xi, 1-46, and xii, 1-9); sometimes identified with St. Mary Magdalene.

Mary I (1516-58), queen of England M-73

Elizabeth imprisoned by E-254  
 Lady Jane Grey and G-178

Mary II (1662-94), queen of England; joint ruler with William III M-73, W-102-3. See also in Index William III  
 Bill of Rights B-109

Mary (born 1867), queen of George V of England; daughter of Francis, duke of Teck; pictures G-53, I-42

Mary (1457-82), duchess of Burgundy, daughter of Charles the Bold; compelled to restore to her Dutch subjects rights lost under her ancestors, thus paving way for Dutch independence

- loses French possessions C-153  
tomb at Bruges B-252
- Mary Baldwin College, at Staunton, Va.; Presbyterian institution for women, founded 1842; liberal arts.
- Maryes' Height, low ridge behind Fredericksburg, Va.; position held by Confederates in battle of Fredericksburg; F-193
- Hancock's attack on H-207
- Marygrove College, at Detroit, Mich.; Roman Catholic institution for women, founded 1910; arts and sciences.
- Maryland, a middle Atlantic state of U.S.; 10,577 sq. mi.; pop. 1,821,244; capital Annapolis: M-76-80, maps M-78, U-188c  
agriculture M-76  
bird, state B-122  
Chesapeake Bay C-182  
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products M-77, chart and list M-76  
U.S. Naval Academy N-44-5
- 'Maryland, My Maryland', song N-25
- Maryland, University of, at College Park, Md.; founded 1807; agriculture, arts and sciences, education, engineering, home economics, graduate school; schools of medicine, dentistry, law, pharmacy, nursing at Baltimore  
former "land grant" college E-182
- Maryland Day (March 25) M-80, H-320
- Maryland yellow-throat W-7
- Marylthurst College, at Marylhurst, Ore.; for women; Roman Catholic; founded 1859; arts and sciences.
- Mary Magdalene ("Mary of Magdala"), convert and devoted follower of Jesus (John xx); commemorated as saint July 22: J-214
- Mary Manse College, at Toledo, Ohio; Roman Catholic institution for women, founded 1922; arts and sciences.
- Marymount College, at Salina, Kan.; Roman Catholic institution for women, founded 1922; arts and sciences.
- Marymount College, at Tarrytown, N. Y.; Roman Catholic institution for women, founded 1907; arts and sciences.
- Mary of Guise (gēz) or Lorraine (1515-60), queen of James V of Scotland, later regent for her daughter, Mary Queen of Scots; arranged French alliance; used Scotland to aggrandize Guise family  
opposes Protestant movement K-37
- 'Mary's Lamb', familiar jingle by Sarah J. Hale, published 1830 in *Juvenile Miscellany*, an American children's magazine; commonly known by first line, "Mary had a little lamb."
- Mary Stuart (1542-87), queen of Scots M-74-6  
Edinburgh associations E-156  
Elizabeth and E-255  
Knox and K-37  
Scott's portrait of S-51  
watch owned by W-39
- Maryville College, at Maryville, Tenn.; Presbyterian institution founded 1819; arts and sciences, home economics.
- Marywood College, at Scranton, Pa.; Roman Catholic institution for women, founded 1915; arts and sciences, music, home economics, education, library science, graduate school.
- Masaccio (mā-zāt'chō) (1402-29), nickname of Tommaso Guidi, Italian painter; first to appreciate aerial perspective, to show figures in bold relief, and to introduce lively expressive action into painting: P-16
- Más a Fuera. *See in Index* Juan Fernández
- Masai (mā-sī'), an African Negroid people speaking a Hamitic language and living in Kenya and Tanganyika; noted for height and fine physique; formerly nomadic but now confined to reserves; famous cattle raisers: E-138, A-39
- Masaridae (mā-sār'i-dē), family of solitary wasps W-35
- Masaryk (mā'sā-rēk), Thomas Garrigue (1850-1937), first president of Czechoslovakia, born Moravia; son of a coachman, became professor of philosophy at Prague, Vienna, London, and Chicago; under his leadership (1918-35) Czechoslovakia attained complete independence; called "Father of Czechoslovakia" ('Suicide and Modern Civilization'; 'Essay on Concrete Logic'; 'The Spirit of Russia'; 'The New Europe'): C-422
- Más a Tierra. *See in Index* Juan Fernández
- Mascagni (mās-kān'yē), Pietro (born 1863), Italian composer, born Leghorn, Italy; best known for 'Cavalleria Rusticana'; other operas include 'Guglielmo Ratcliff' and 'Nero'
- 'Cavalleria Rusticana', story O-228
- Mascara (mās-kā-rā'), fortified town in Algeria, about 45 mi. s.e. of Oran, on slope of Atlas Mts.; stands on site of Roman colony; pop. 32,000.
- Mas'cot M-30
- Mascouten, tribe of Indians of Algonquian family who lived in Wisconsin between Fox and Wisconsin rivers, in n. Illinois, in Indiana at mouth of Wabash River, and in lower Michigan peninsula; name means "little prairie people."
- Mas d'Azil, town in s. France  
archeological remains M-48d
- Masefield, John (born 1878), English poet, dramatist, and novelist; ran away to sea in youth and lived life of wanderer until 1897; won first fame with sea poems; became poet laureate 1930 ('Salt-Water Ballads', 'Reynard the Fox', 'The Daffodil Fields', poetry; 'The Tragedy of
- Nan', 'Tristan and Isolte', 'The Coming of Christ', plays; 'Sard Harker', 'Odttaa', 'The Hawbucks', novels): E-289
- Mashie, a golf club, picture G-118
- Masho'naland, province of Southern Rhodesia s. of Zambezi River; home of the Mashona, a peaceful Bantu people; European pop. about 27,000 occupied by British S-202
- Mask, a covering to conceal or disguise the face  
Greek actors' D-92, T-76  
Indian I-56
- Mask, an allegorical spectacle. *See in Index* Masque
- Mask, gas G-25  
adsorption by charcoal C-303  
used in coal mines C-286
- Mask, oxygen, picture A-71
- Maskinonge (mās'kin-ōng), or muskellunge, a fish of the pike family F-74
- Mason, Charles (1730-87), English astronomer and surveyor; fixed precise measure of a degree of latitude in America  
Mason and Dixon's line M-80
- Mason, Daniel Gregory (born 1873), American composer and writer on music, born Brookline, Mass., grandson of Lowell Mason; professor of music, Columbia University; compositions for violin, piano, orchestra; author of 'From Grieg to Brahms', 'The Romantic Composers', 'Music in My Time'.
- Mason, Edith (Barnes) (born 1893), American opera singer, born St. Louis, Mo.; sang in Milan and Paris, later with Metropolitan and Chicago opera companies.
- Mason, George (1725-92), American Revolutionary statesman, born Fairfax County, Va.; author of Virginia Bill of Rights and Constitution of 1776; member of Constitutional Convention.
- Mason, James Murray (1798-1871), American jurist and statesman, born Mason's Island, Va.; author of Fugitive Slave Law; Confederate commissioner to Great Britain 1861  
Trent affair T-138
- Mason, John (1586-1635), American colonist, born England  
founder of New Hampshire N-88  
secures grant in Maine M-40
- Mason, John Young (1799-1859), American statesman, born in Virginia; secretary of the navy 1844-45, 1846-49; U.S. minister to France 1854-59  
Ostend Manifesto C-250-1
- Mason, Lowell (1792-1872), American musician, born Medfield, Mass.; pioneer of music instruction in public schools, and composer of hymn tunes ('Nearer, My God, to Thee').
- Mason, Max (born 1877), American educator and mathematician, born Madison, Wis.; invented devices for detecting submarines; taught at Massachusetts Institute of Technology, Yale, and University of Wisconsin; president University of Chicago 1925-28; president Rockefeller Foundation 1929-35; on faculty California Institute of Technology since 1936.
- Mason, Stevens Thomson (1811-43), American statesman, born Leesburg, Va.; governor of Michigan M-155
- Mason, Walt (1862-1939), American writer of humorous verse, born Columbus, Ontario; self-educated; daily prose poems in newspapers of U.S. and Canada ('Rippling

- Rhymes'; 'Horse Sense'; 'Terse Verse'; 'Walt Mason, His Book').
- Mason, William (1829-1908), American musician, born Boston, Mass.; son of Lowell Mason; was leading American teacher of piano ('Memoirs of a Musical Life').
- Mason and Dixon's line M-80
- Mason ant A-213
- Mason bee, solitary bee of the genus *Osmia*; constructs cells of clay under stones, in stems, and elsewhere.
- Mason City, Iowa, railroad center and distributing city for agricultural, stock-raising, and quarrying district 110 mi. n. of Des Moines; pop. 27,080; cement, brick and tile, packed meat, beet sugar; railroad shops: *map* I-120
- Masonite, lumber substitute made of waste wood P-245c
- Masonry, brick B-238
- Masons, or Freemasons, secret fraternity F-193
- memorial to Washington V-307
- Mason wasps, types that make mud nests W-34
- Maspero (*mā-spū-rō*'), Gaston Camille Charles (1846-1916), French Egyptologist; professor Egyptology, Collège de France; headed government archeological mission to Egypt 1880; made director general excavations 1881; books on Egyptology.
- Masqat, Arabia. *See in Index* Muscat
- Masque, or mask, an allegorical spectacle with singing, dancing, and elaborate settings; so called because actors originally wore masks; originating in Italy, the entertainment flourished in England in the 16th and 17th centuries, with Ben Jonson as the most popular writer, aided by Inigo Jones, the famous designer; Milton's 'Comus' best example: T-76
- Jonson's work J-227
- modern P-11, 12
- mummers, or maskers, Old English C-228
- Mass, in Roman Catholic church, the celebration of the sacrament of the Eucharist, commemorating the passion and death of Christ.
- Mass, in physics, the amount of matter in a physical object; distinguished from the object's weight because weight varies with force of gravity; determined by comparison with some standard mass, as the standard kilogram: P-189, G-142
- conservation C-167a, P-189
- convertible to energy P-195
- Massachu'set, an Algonquian Indian tribe which occupied the country about Massachusetts Bay I-53, M-81
- Massachusetts, one of the New England states; 8257 sq. mi.; pop. 4,316,721; cap. Boston: M-80-6, *maps* M-82, U-188c
- bird, state B-122
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- products, *chart* M-82, *list* M-80
- Salem Maritime Historic Site N-18
- water power L-76, L-210; Fall River F-7
- Massachusetts Agricultural College. *See in Index* Massachusetts State College
- Massachusetts Bay, arm of Atlantic indenting e. coast of Massachusetts, from Cape Ann on n. to Plymouth harbor on s.: *map* M-82
- Massachusetts Bay Colony, a group of settlements around Massachusetts Bay founded by English Puritans on land granted in 1629 to Massachusetts Bay Company; John Winthrop, John Endicott, and John Cotton early leaders M-86
- government A-153, 154
- prohibition law P-350
- religious foundations A-151
- Winthrop as governor W-119
- Massachusetts Bay Company A-153
- vessels of, *picture* U-233
- Massachusetts Indians. *See in Index* Massachusetts
- Massachusetts Institute of Technology, at Cambridge, Mass.; incorporated 1861 (opened 1865); architecture, engineering and sciences; graduate and undergraduate courses; laboratory equipment permits experimentation almost on industrial scale.
- Massachusetts State College, at Amherst, Mass.; chartered 1863 (opened 1867) by the state; 4 years' course, major work in agriculture, horticulture, home economics, physical and biological sciences and social science.
- Massacre of St. Bartholomew (1572) C-300
- Massacre of the Innocents, slaughter of the children of Bethlehem by Herod's soldiers J-213-14
- Massage (*mā-sūzh'*), (from Greek word for "knead") M-109
- Massalia, Greek name for Marseilles, France.
- Massanet, Damian, Spanish priest, active as missionary in Mexico and Texas about 1690; founded important Texas missions: T-59
- Massasauga (*Sistrurus catenatus*), a rattlesnake found in cent. and s.w. United States; body gray with brown splotches; length about 3 ft.
- Mas'sasoit (1580?-1661), American Indian, chief of Wampanoags in Massachusetts; steadfast friend of Plymouth colonists
- joined first Thanksgiving T-74, *picture* H-319
- treaties with Pilgrims P-261
- Massawa, or Massawa (*mās-sū'wā*), seaport in Eritrea, on Red Sea; pop. 17,000; wireless station: *maps* E-308, A-42a
- Massays, Quentin. *See in Index* Matsys
- Masséna (*mā-sā-nā'*), André (1756?-1817), duke of Rivoli and prince of Essling, perhaps the greatest of Napoleon's marshals, called by him "spoiled child of victory"; victorious in Italy, Poland, Germany; first serious defeat by Wellington in 1810 in Peninsular War; thereafter saw no more active service.
- Massena, N. Y., village on Grass River, 35 mi. n.e. of Ogdensburg in agricultural and dairying region; pop. 11,328; aluminum and mica plants, silk mills.
- Massenet (*mā-sū-nē'*), Jules Emile Frédéric (1842-1912), French composer of songs, operas, orchestral works; his distinctive style appears best in love scenes of his operas ('Thaïs'; 'Le Jongleur de Nôtre Dame')
- 'Le Jongleur de Nôtre Dame', story O-230
- 'Manon', story O-231
- 'Thaïs', story O-233-4
- Massey, Hart Almerin (1823-96), Canadian manufacturer and philanthropist, born Haldimand, Upper Canada; manufactured agricultural implements; left large endowments to public institutions in Toronto.
- Massilia, Roman name for Marseilles.
- Massillon, Ohio, industrial city 100 mi. n.e. of Columbus; pop. 26,644; trade in coal, sandstone, grain, and livestock; iron and steel products, aluminum cooking utensils, furnaces: *map* O-210
- 'Mass in B minor', chorale by Bach M-311
- Massine (*mā-sēn'*), Leonide (born 1896), ballet dancer and choreographer, born Moscow, Russia; studied with Fokine; joined Diaghilev's ballet at 17; first New York appearance 1916; his famous ballets include 'Destiny', 'Gaité Parisienne', 'Beautiful Danube', 'The Rite of Spring'.
- Mas'singer, Philip (1584-1640), English dramatist; author of 15 plays and collaborator with Fletcher and others in many more; most of his plays have an obvious moral intention, but his heroes are too good and his villains too wicked to be convincing ('A New Way to Pay Old Debts').
- Massive, Mount, peak of Sawatch Range of Rocky Mts. in central Colorado (14,418 ft.): *map* C-310
- Masson (*mā-sōn'*), Antoine (1636-1700), French engraver E-295
- Mass production U-251a, I-74j
- advertising stimulates A-23
- airplanes A-82
- automobiles: assembly line A-391, *pictures* A-390, M-11; pioneers A-388, F-153
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ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch



- efficiency and dangers I-75-6  
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electric motors essential E-237  
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Whitney father of W-96
- Mass spectrograph, a physical instrument R-16
- Massys, Quentin. *See in Index* Matsys
- Mast, nuts borne by beech, oak, and other forest trees (acorns, beech-nuts) B-79
- Mast, ship's S-119
- Master, a university degree U-257  
origin U-260
- "Master, remember the Athenians" P-135
- Masters, Edgar Lee (born (1869), American author, born Garnett, Kan.; achieved wide fame with 'Spoon River Anthology' (1915), a collection of brief verses in which the dead of a Middle West graveyard expose the bare bones of their lives; practised law in Chicago after 1891 ('Domesday Book'; 'The Fate of the Jury', poetry; 'Children of the Market Place', novel; 'Lincoln, the Man' and 'Vachel Lindsay, a Poet in America', biography).
- Master singer (*meistersinger*) M-310
- Mastersongs G-62
- Mas'tic, a resin G-188, P-32b
- Mastication, or chewing, of food H-373, D-69
- Mastic cement P-32b
- Mastiff, a dog D-79, 82
- Mas'todon, a hairy, elephant-like animal now extinct M-44
- Mastoid process, a projection of the temporal bone above and behind the ear; sometimes called the mastoid bone: S-156
- Masulipatam (*mā-sq-ñ-pā-tām'*), or Bandar, seaport of British India in n. Madras on one of mouths of Kistna River; pop. 57,000; weaving, bleaching, cloth printing, and rug making: *map* A-332c
- Masurian Lakes, a sickle-shaped group of lakes in s. part of East Prussia; strategically important in Hindenburg's eastern campaigns in 1st World War  
battles of W-155, *map* W-156
- Masurium, a chemical element discovered 1925 by X-ray methods, *table* C-168
- Matabeleland (*māt-ā-bē'lē-lānd*), province in s. part of Southern Rhodesia; home of the Matabele, a Zulu people; European pop. 24,000  
British conquer S-202  
buffaloes A-203  
native revolt R-99
- Mat'ador, in bull fights, the man who administers the fatal stroke to the bull: *picture* S-230
- Matagor'da Bay, inlet of Gulf of Mexico at mouth of Colorado River, indenting s. coast of Texas  
La Salle's settlement L-67, T-59
- Matagorda Island, long narrow island off coast of Texas, s.w. of Matagorda Bay: *map* T-56
- Matamat'a, a South American turtle T-168
- Matamo'ras, river port of Mexico on Rio Grande opposite Brownsville, Tex.; pop. about 8000; captured by Zachary Taylor in Mexican War (1846): *map* M-133
- Matanuska Valley, in s. Alaska, formed by Matanuska and Susitna rivers  
homestead colony A-104, *map* A-105
- Matanzas (*mā-tān'sās*), seaport and railroad center on n. coast of Cuba, 50 mi. e. of Havana; pop. 46,000; chief export, sugar: *map* C-412
- Matanzas River, or Matanzas Bay, inlet of Atlantic in e. coast of Florida on which St. Augustine is located  
Fort Matanzas National Monument N-22
- Matches M-86-90  
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- Match-lock, early hand-gun F-48, *picture* F-49
- Match play, in golf G-118
- Maté, or yerba maté, also called Paraguay tea T-22, 27, *picture* S-205c
- Materialism, dialectical C-324d
- Materialists, in philosophy P-173
- Materials, strength of. *See in Index* Strength of materials
- Mat'e'ria med'ica (Latin words meaning materials of medicine), that part of the study of medicine which deals with the source, preparation, and use of drugs.
- Mathemat'ics, the science of number and quantity M-90. *See also in Index* Algebra; Arithmetic; Geometry; Graph; Trigonometry
- Arabs' contributions M-216, E-171
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- projection, of maps M-58-9
- Mather (*māth'ēr*), Cotton (1663-1728), American preacher and scholar, born Boston; son of Increase Mather; leader of conservative New England Puritans and of Salem witchcraft persecution; historian of New England ('Wonders of the Invisible World'; 'Magnalia Christi Americana').
- Mather, Increase (1639-1723), American clergyman and author, born Dorchester, Mass.; pastor of North Church, Boston, for 62 years; president of Harvard College 1684-1701 ('Remarkable Providences'; 'A Brief History of the War with the Indians in New England').
- Matheson, Samuel Pritchard (1852-1942), Canadian Anglican prelate; dean of St. John's Cathedral, Winnipeg, and archbishop of Rupert's Land; primate of all Canada 1909-31.
- Mathew (*māth'ū*), Theobald (1790-1856), "Father Mathew," Irish (Capuchin) priest and temperance reformer; worked among the poor in Ireland; also campaigned for temperance in England and America.
- Mathews, Shailer (1863-1941), American Biblical scholar, theologian, and educator, born Portland, Me.; dean of Divinity School, University of Chicago since 1908 ('The Church and the Changing Order'; 'The French Revolution'; 'The Faith of Modernism'; 'The Student's Gospels'; 'New Faith for Old—an Autobiography').
- Mathewson, Christy (1880-1925), one of foremost pitchers in baseball history; elected to Baseball Hall of Fame; with New York Nationals 1900-16; first pitcher of century to win 30 or more games a year for three successive years: *picture* B-56
- Mathiola (*mā-thi'ō-lā*), a genus of plants including the stock. *See in Index* Stock
- Matil'da (died 1083), queen of William I of England and daughter of Baldwin V, count of Flanders W-101
- Matilda (1080-1118), queen of Henry I of England and daughter of Malcolm III and St. Margaret of Scotland H-275
- Matilda (1102-64?), queen of England (crowned 1141), daughter of Henry I of England; contested for throne against Stephen: S-284  
besieged at Oxford O-258
- Matin (*māt'in*), a morning service or prayer
- monastic churches M-233, 234
- Matisse (*mā-tēs'*), Henri (born 1869), French artist, best known as painter and lithographer; one of leaders of post-impressionist school; turned to Modernism after a period of academic painting; distinguished for simplification of drawing, skilful composition, broad sweeps of color, and decorative pattern: P-26
- Matriar'chate, a society in which the mother rules F-8  
in Sumatra F-11
- Matrimony vine, an ornamental spiny shrub (*Lycium vulgare*) of the nightshade family with long slender climbing or trailing branches and showy pale-purple bell-shaped flowers, which are followed by orange-red berries.
- Matrix, in type-casting T-173
- linotype L-150-3
- monotype M-238, 239
- stereotype S-287
- Matsuoka (*māt-sq-ō'ká*), Yosuke (*yō'sq'kē'*) (born 1880), statesman born Yamaguchi, Japan; went to Portland, Ore., 1893; brought up in Christian religion by Scottish family; law degree University of Oregon 1900; returned to Japan about 1901; in foreign service 1904-20; after 1929 prominent in Japan's Manchurian policy and one of first to advocate imperialistic militarism; adviser to Premier Konoye 1937; became foreign minister in 1940, forced to resign July 1941.
- Matsys (*māt-sis'*), Quentin (also Massys, or Massays) (1466-1530), Flemish realistic artist; religious subjects, portraits, etc. ('Burial of Christ', in Antwerp museum; 'Story of St. Anne', in Brussels gallery).
- Mattagami, river in Ontario, Canada, 275 mi. long, tributary of Moose River.
- Mattathias (died 167 B.C.), Jewish priest J-217
- Matte (*māt*), impure metal produced by smelting  
in copper smelting C-360, *diagram* C-359
- Matter, in physics, anything having properties such as weight and extension identifiable by the senses; contrasted in physical theory with energy, which is recognizable only through its effects on matter: P-189-90, 195, *Outline* P-196

Key—cāpe, āt, fār, fāst, whqt, fāl; mē, yēt, fērn, thēre; tce, bīt; rōw, wōn, fōr, nōt, dō; cūre, bīt, ryde, fūll, būrn;

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radiant R-13, 15, 16: in radioactive substances R-32-4  
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transformed in hot stars A-344
- Matterhorn** (*mät'ēr-hörn*) (French Mont Cervin), peak in Alps on w. frontier between Switzerland and Italy; 14,782 ft.: S-349, map S-351, picture A-136
- Matthew**, Saint, apostle and traditional author of the First Gospel; festival September 21: A-229
- Matthew**, Gospel of Saint, first of the Four Gospels and first book of the New Testament.
- Matthew of Paris** (1200?-59), English chronicler and monk of St. Albans; his 'Chronica maiora' is a vivid and complete picture of life in Middle Ages although not always accurate.
- Matthews**, (James) Brander (1852-1929), American man of letters, born New Orleans; professor at Columbia University after 1892; dramatic criticism, essays, plays ('Shakespeare as a Playwright'; 'Principles of Playmaking'; 'Molière: His Life and His Works').
- Matthews**, William (1822-96), book-binder and writer on bookbinding, born Aberdeen, Scotland; emigrated to New York in 1843; became famous for good workmanship and scholarly knowledge of the history of his craft.
- Matthias**, one of the apostles; commemorated as saint February 25: A-229
- Matthias I**, Hunyadi (1440-90), king of Hungary, also called Matthias Corvinus from the raven (*corvus*) on his escutcheon; son of János Hunyadi; elected king 1458, repeatedly defeated Emperor Frederick III, Turks, Poles, and became most powerful ruler in central Europe; equally capable as soldier, administrator, orator, law-maker.
- Matthioli** (*mät-tō-yōl'ē*), supposed "Man in the Iron Mask" I-147
- Matthison**, Edith Wynne (Mrs. Charles Rann Kennedy) (born 1875), American actress, born in England; Shakespeare, Greek and old English revivals ('Everyman'; 'Iphigenia in Tauris'), modern drama.
- Mat'to Gros'so** (*mät'tō grōs'sō*) (meaning great forest), large state of central Brazil, little settled and partly unexplored; 570,286 sq. mi.; pop. about 350,000; cap. Cuyabá; cattle, timber, diamonds; formerly extensive gold mining: B-226c plateau, map B-226
- Mattoon**, Ill., city 70 mi. s.e. of Springfield; pop. 15,827; broom corn, fruit, and live stock interests; brooms, shoes, foundry products, and Diesel engines; railroad shops.
- Matura diamond**, a colorless or de-colored zircon from Ceylon used as a gem.
- Matzoth** (*mät'sōth*), or matzos, unleavened bread P-85
- Maubeuge** (*mō-būzh'*), France, fortified town near Belgian border, 50 mi. s.e. of Lille; pop. 24,000; taken by Germans 1914 and 1940.
- Maude**, Sir (Frederick) Stanley (1864-1917), British general in 1st World War; took part in Dardanelles and Kut relief expeditions captures Baghdad W-160
- Maudsley**, Henry, inventor of lathe slide rest T-111
- Maugham** (*mām*), William Somerset (born 1874), English novelist, short story writer, and dramatist; born in Paris; studied medicine but did not practise; spent much of life abroad—France, the Orient, America; work distinguished by irony, and objective dissection of character ('Of Human Bondage'; 'The Moon and Sixpence'; 'Cakes and Ale', novels; 'The Circle'; 'The Constant Wife'; 'The Letter', plays): E-288
- 'Don Quixote' characterized C-136
- Maut** (*mä'q-ē*), one of the Hawaiian Islands; 728 sq. mi.; pop. 46,919: H-239, 241, 242, maps H-242, 243
- Haleakala volcano** N-22a
- Mau'nee River**, flows into Lake Erie near Toledo, Ohio, after course of 150 mi. through n.e. Indiana and n.w. Ohio: map O-210
- Mauna Kea** (*mā'q-nā kā'ā*) (Hawaiian "white mountain"), extinct volcano on island of Hawaii; highest peak in Pacific islands (13,784 ft.): H-242, map H-242
- Mauna Loa** (*lō'ā*) ("great mountain"), active volcano on island of Hawaii; crater of Kilauea on e. slope: H-242, N-22a, map H-242
- Kilauea crater**, pictures H-240, L-73, V-332, 334
- Maundy Thursday**, or Holy Thursday E-140
- Maunoury** (*mō-nū-rē'*), Michel Joseph (1847-1923), French general, recalled from retired list in 1914; commanded VI Army, which turned Von Kluck's left flank at first battle of Marne.
- Maupassant** (*mō-pā-sän'*), Guy de (1850-93), French novelist of the naturalistic school, one of the greatest masters of the short story; portrayed human character as he saw it, without pointing a moral; because of a nervous malady which finally led to insanity and death, many of his later works are morbid ('The Piece of String'; 'The Neck-lace'; 'A Life'; 'Pierre and Jean'): F-198, picture F-196
- Maurandia**, a genus of perennial plants of the figwort family, climbing by means of the leaf stems; native to Mexico and s.w. U.S. Related to snapdragon; leaves triangular; flowers irregular trumpet-shaped, white through blue.
- Maurepas** (*mō-rū-pā'*), Lake, s.e. Louisiana; 13 mi. long; connected with Lake Pontchartrain by 3 mi. channel: map L-206
- Mauretania**. See in Index Mauritania
- 'Mauretania'**, ocean liner S-124
- Mauriac** (*mō-rē-yāk'*), François (born 1885), French author ('Therese'; 'The Desert of Love'; 'The Kiss to the Leper'; 'Genetrix'): F-199
- Maurice of Nassau** (1567-1625), prince of Orange (son of William the Silent), Dutch general, one of ablest of his age; successfully resisted Spanish domination.
- Maurice of Saxony** (1521-53), duke and, by conquest of his cousin John Frederick, elector of Saxony; one of foremost generals and most cunning diplomats of his day; extorted from Emperor Charles V Treaty of Passau (1552), giving Protes-
- tants liberty of worship until Diet of Augsburg
- deserts Protestants R-66
- Maurice River**, in s. New Jersey; flows s.e. into Delaware Bay; navigable to Millville: map N-90
- Mauritania** (*mā-rī-tā'ni-ā*), also Mauretania, ancient name for n.w. Africa, comprising modern Morocco and w. Algeria; in time of Caesar an independent kingdom; later a Roman province.
- Mauritania**, a colony of French West Africa; 323,000 sq. mi.; pop. 385,000: map A-42a
- Mauritius** (*mā-rish'ūs*), formerly Isle de France, island in Indian Ocean; British colony; 720 sq. mi.; pop. 425,000; cap. Port Louis: M-90-1, map A-332c
- dodo D-75
- postage stamps, picture S-268
- Mauritshuis** (*mou'rits-hois*), picture gallery, The Hague H-194
- Maurois** (*mōr-wū'*), André (born 1885), French writer, born Emile Herzog; particularly popular in America and England for his fictionalized biographies; began work during 1st World War in which he served as liaison officer in British General Headquarters ('Ariel, or the Life of Shelley'; 'The Life of Disraeli'; 'Don Juan, or the Life of Byron'; 'Atmosphere of Love'): picture F-198
- Maurras** (*mō-rā'*), Charles (born 1868), French critic and journalist, a staunch nationalist; he preached discipline in art, politics, morality; influenced Italian Fascisti ('Trois idées politiques'; 'Les amants de Venise'; 'Jean Moréas'; 'L'Etang de Berre').
- Maury** (*mā'ri*), Matthew Fontaine (1806-73), American oceanographer and meteorologist, born Spotsylvania County, Va.; first to advocate uniform system of recording data to guide ocean vessels; furnished, in words of Cyrus Field, brains for laying the first Atlantic submarine cable ('Physical Geography of the Sea'): C-9
- at Virginia Military Institute V-307
- Mausier** (*mou'zēr*), military rifle box-magazine F-50
- Mäuseturm** (*mō'zē-tūrm*). See in Index Mouse Tower
- Mausoleum of Halicarnassus** S-82, pictures G-167, S-83
- Mausolus** (*mā-sō'lūs*) (4th century B.C.), king of Caria, whose wife Artemisia erected famous "mausoleum" at Halicarnassus to his memory S-82
- Mauve** (*mouv*), Anton (1838-88), Dutch landscape and animal painter, chiefly self-taught; most celebrated for his quiet rural scenes in Holland which he interpreted with insight and feeling.
- Mauve**, a delicate purple or lilac color; also a purple dye
- first aniline dye D-121
- Mavericks**, unbranded cattle on the range C-110
- Mavis** (*mā'vis*), the song-thrush T-88
- Mavor**, James (1854-1925), Canadian political economist, born in Scotland; professor of political economy, University of Toronto 1892-1923; author of government reports on immigration and on Canada's wheat producing capacity.
- Mawson**, Sir Douglas (born 1882), Australian explorer and geologist, born England; one of two members of Shackleton's expedition who located south magnetic pole; com-

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

manded expeditions to Antarctic 1911-14 and 1929-30  
Antarctic exploration P-286, A-216  
Mawworm W-180b

Max, of Baden, Prince (1867-1929), German soldier and statesman; as imperial chancellor (appointed Oct. 3, 1918) he began negotiations for armistice; brought pressure on Kaiser and announced his abdication; Nov. 10, 1918, handed government control to Ebert.

Max, Adolphe (1869-1939), burgo-master of Brussels at beginning of 1st World War; for 3 months, until imprisoned in Germany, heroically resisted Germans who occupied city; afterward member Belgium Chamber of Representatives and minister of state.

Maxentius, Marcus Aurelius Valerius (died 312), elected Roman emperor, West, 306 A.D.  
Constantine defeats C-346

Maxilla, or superior maxilla, bone of the upper jaw S-156

Maxilla, biting jaws of insects I-87, pictures I-82

Maxilliped, of crawfish, picture C-391

Maxim, Hiram Percy (1869-1936), inventor, born Brooklyn, N. Y.; invented Maxim silencer for firearms, and applied principle to silencing other noises; founded (1914) the American Radio Relay League, president 1914-36; son of Sir Hiram Stevens Maxim, and nephew of Hudson Maxim.

Maxim, Sir Hiram Stevens (1840-1916), inventor, born Sangerville, Me.; invented Maxim automatic machine gun; became British subject in 1900; brother of Hudson Maxim.

Maxim, Hudson (1858-1927), inventor, born Orneville, Me.; invented explosives and was first to make smokeless gunpowder in U. S.; brother of Hiram Stevens Maxim.

Maxim gun M-6

Maximilian I (1459-1519), Holy Roman emperor; succeeded 1493; called 2d founder of House of Hapsburg, which, by marriages of himself, son, and grandson, gained Netherlands, Spain, Hungary, and Bohemia, thus creating vast empire of Charles V and his successors marries daughter of Charles the Bold C-153  
tomb M-123

Maximilian I (1756-1825), first king of Bavaria; succeeded as elector 1799; aided Napoleon and received title of king as a reward.

Maximilian II (1811-64), Bavaria, monarch of liberal tendencies; succeeded to throne on abdication of his father 1848; opposed exclusion of Austria from German confederation; father of the mad kings Ludwig II and Otto.

Maximilian (1832-67), archduke of Austria and emperor of Mexico; younger brother of Emperor Francis Joseph; established on Mexican throne 1864 by France: M-142d

Maximilian I, the Great (1573-1651), elector and duke of Bavaria, helped form Catholic League which opposed Protestant Union in Thirty Years' War; party to peace of Westphalia 1648; considered ablest Catholic ruler of his time.

Maximilian, Alexander Philipp, Prince of Wied-Neuwied (1782-1867), German soldier and traveler; major general in Prussian army; explored Brazil, traveled in U.S. ("Travels in the Interior of North America").

Maxixe (má-shé'shā), a dance L-67k  
Maxwell, James Clerk- (1831-79), Scottish physicist C-265, picture E-232

electrical theories C-265, E-233. R-26  
May, Phil (1864-1903), English black-and-white artist, famous for his skill in using the fewest possible lines; chiefly depicted "low life" in London.

May, English name for hawthorn H-248

May, month M-91  
birthdays of famous persons. See in Index Anniversaries and birthdays, table

birthstone G-25

holidays H-320-1, 322

May, Cape, southernmost part of New Jersey, map N-90

Maya. See in Index Mayas

Mayaguana, one of southernmost of the Bahama Islands; area 96 sq. mi.; pop. about 1000  
U. S. naval and air base B-15

Mayaguez (mā-yū-jās'), Puerto Rico, city on w. coast; pop. 50,376; railway connection with interior; export trade: P-311

Mayakofsky (mā-yū-kōf'skī), Vladimir (1894-1930), Russian poet and dramatist  
chief works R-198

place in Russian literature R-197

Mayapan (mā-yā-pān'), ancient city of Yucatan; Mayan ruins: Y-211

May-apple M-91

mandrake, old-world species M-53

Mayas (mā'yās), race of Indians inhabiting peninsula of Yucatan at time of Spanish conquest; developed a remarkable civilization: Y-210-11, C-132-3, G-181d  
building methods Y-211  
calendar C-21

Chichen-Itza Y-211, pictures E-345, A-409

civilization A-147-8, 149, Y-211, D-113b

descendants in Guatemala G-181a-b  
Kukulcan M-142b

Uxmal Y-211, picture A-148  
writing W-185

May beetle, or June bug J-228

May Day, festival M-91

labor demonstrations L-45

parade in Moscow, picture M-263

Robin Hood's festivals R-119

Mayence (mā-yāns'). See in Index Mainz

Mayer, Frank Blackwell (1827-1908), American artist, born Baltimore  
founding of Maryland, picture A-152

Mayer (mā'yēr'), Julius Robert von (1814-78), German physicist; first to suggest theory of conservation of energy; applied mechanical theories to study of animal heat.

Mayflower, trailing arbutus, or ground laurel A-248

'Mayflower', Pilgrims' ship M-91-4, pictures M-91, 93

John Alden A-113

memorial, Plymouth, England P-261

Mayflower Compact M-92

signing, picture M-93

Mayflower Descendants, Society of M-92

May-fly, shad-fly, or day-fly M-94

Mayhew (mā'hū), Jonathan (1720-66), American clergyman, born Martha Vineyard; upheld cause of colonies in sermons; said to have made first suggestion of united action by colonies: U-235

Ma'yo, Henry Thomas (1856-1937), rear admiral U.S. Navy, retired in 1920; graduate of U.S. Naval Academy; admiral and commander in

chief Atlantic fleet (1916-19); of U.S. fleet (1919); reverted to rear admiral upon division of fleet  
Tampico incident (1914) M-142c

Mayo, William James (1861-1939), and Charles Horace (1865-1939), American surgeons, brothers who developed famous Mayo clinic; established Mayo Foundation for Medical Education and Research (1915), now a department of University of Minnesota for graduate work. See also in Index Mayo Clinic

Mayo, 3d largest county in Ireland (2084 sq. mi.) in Connaught province, bounded n. and w. by Atlantic; pop. 161,000; mountainous in w., flat in e.; cattle, salmon, linen  
Irish Land League B-212  
mountains, map E-270a

Mayo Clinic, surgical clinic at St. Mary's Hospital, Rochester, Minn., founded 1889 by William J. and Charles H. Mayo with their father William W. Mayo; attended by large numbers of surgeons, many of whom do graduate work: M-194  
Mayon (mā-yōn'), volcano in Philippines P-164

May'or, chief executive of American villages and cities M-302

Mayor of the Palace (major domus), official in Frankish kingdom under Merovingian rule

Charles Martel C-153

founds Carolingian dynasty F-180  
Pepin the Short C-144

Mayotte (mā-yōt') Island. See in Index Comoro Islands

Maypole M-91

dance D-93, picture F-133  
Sweden S-335

Maypop, or passion flower P-85

pollen grain, picture F-125

Mayville, N.D., town in e., 50 mi. n.w. of Fargo; pop. 1351; state teachers college.

Maywood, Calif., city 6 mi. s. of Los Angeles, on Los Angeles River; pop. 10,731; chiefly residential city for surrounding industrial area.

Maywood, Ill., residential suburb of Chicago on Des Plaines River 10 mi. w. of Chicago; pop. 26,648; makes tin plate and cans; lithographing works.

Mazagan (māz-ā-jān'), Morocco, seaport 50 mi. s.e. of Casablanca; agricultural products; pop. 24,000; map A-127

Mazarin (mā-zā-rān'), Jules (1602-61), French cardinal and statesman, born Italy; favorite of Anne of Austria; French premier under Louis XIV; continued Richelieu's policy of weakening nobility at home and Hapsburgs abroad: L-201  
introduces opera to France O-228  
Thirty Years' War T-80

Mazarin Bible, Gutenberg Bible, or 42-line Bible, first book printed from movable type B-105, P-346-7, L-102, picture B-179

Mazar-i-Sharif (mā-zār' ī shār-ēf'), Afghanistan, also Mazar-i-Sherif, fortified city and important military post; pop. 20,000; its mosque is venerated as tomb of Ali, son-in-law of Mohammed: T-158, map A-332b

Mazar' Province, or Afghan Turkistan, in n. Afghanistan; area 57,000 sq. mi.; pop. 800,000: T-158

Mazatlán (mā-sāt-lān'), Mexico, port on w. coast at entrance to Gulf of California; pop. 29,000; wireless station; outlet for mining region; captured by Constitutionalists (1914): M-134, map M-133



Maz'da, or Ahura Mazda, in Zoroastrianism Z-231

Mazda electric lamps E-234

Maze, a confusing network of tunnels or corridors through which it is difficult to find passage; small models used to test learning ability of animals: *picture* L-81. *See also* in *Index* Labyrinth

Mazeppa (*mā-zēp'ā*), Ivan (1644-1709), Cossack chief, powerful in Russia under Peter the Great; deserted to Charles XII of Sweden; subject of poem by Byron and symphonic poem by Liszt: C-374

Mazurian Lakes. *See* in *Index* Masurian Lakes

Mazurka (*mā-zūr'hā*), a lively dance or music for the dance; generally in  $\frac{3}{4}$  or  $\frac{4}{4}$  time; originated in Poland in 16th century.

Mazzini (*mūt-sē'nē*), Giuseppe (1805-72), famous Italian revolutionary leader M-94

influence on papacy P-227

sets up republic I-157, M-94

Mboma (*'m-bō'mg*). *See* in *Index* Boma

Mbomu River, a partly dried-up water-course on n. boundary Congo State, *map* C-331

M day, in United States Army A-307d

Me, a personal pronoun correct use of P-352

Mead, Larkin Goldsmith (1835-1910), American sculptor, born Chesterfield, N. H.; feeling and great detail but rough modeling (Lincoln monument at Springfield, Ill.).

Mead, William R. (1846-1928), American architect, born Brattleboro, Vt.; member of firm McKim, Mead and White. *See* in *Index* McKim, Charles F.

Mead, Lake, at Boulder Dam (in Black Canyon of Colorado River), world's largest man-made lake, 115 miles long, storage capacity 32,359,274 acre-feet; named for Dr. Elwood Mead, commissioner of reclamation while Boulder Dam was being constructed; has become a recreation center developed by the National Park Service: D-8

Meade, George Gordon (1815-72), American Civil War general M-95, *picture* G-81

Meade, Stephen Warren (born 1892), journalist and author of books of adventure and outdoor life for boys; born Providence, R. I. ('Longshanks'; 'Red Horse Hill'; 'Tommy Model Tommy'; 'Boy with a Pack')

Meades Ranch, Kan., surveying station S-332

Meadow beauty, or deergrass, a genus of wild flowers (*Rhexia*) of the melastoma family, with square or round stems, opposite narrowly oval leaves, and purple or yellow flowers with conspicuous protruding stamens; found in bogs of North America.

Meadow fescue, a perennial plant (*Festuca elatior*) of the grass family, native to Eurasia but naturalized in cooler parts of N. America; tall with flat leaves; flower clusters, much-branched and nodding; used as hay and pasture crop.

Meadowlark M-95, *color plate* B-138

Meadow mouse, or field mouse M-293

occasional migrations M-166

Meadow musroom, *color plate* M-306a-b

Meadow-rue, or Thalictrum (*thā-līk'-trūm*), a genus of perennial plants

of the buttercup family, found chiefly in temperate regions. Erect-growing with finely-cut leaves, similar to maidenhair fern; flowers in feathery clusters, tiny, greenish white, purple, or yellow.

Meadow saffron. *See* in *Index* Colchicum

Meadville, Pa., city 86 mi. n. of Pittsburgh in agricultural and iron and steel manufacturing region; railroad shops; slide fasteners, rayon yarn, machinery; pop. 18,919; Allegheny College: *map* P-112

Meagher, Thomas Francis (1823-67), Irish revolutionary leader and American soldier; one of founders of Irish Confederation; sentenced to life imprisonment for revolutionary efforts against England; escaped to New York City; during Civil War organized Irish brigade; attained rank of brigadier general; made secretary of Montana territory at close of war.

Mealies, South African name for Indian corn.

Meals H-373. *See also* in *Index* Cooking; Food

Mealy bug, a scale parasite S-35

method of extermination I-90

Mean, arithmetic, in statistics G-136f, g

Mean'der, winding course of a river R-110, *picture* R-110

Mean'der River, also Maeander, in Asia Minor, now called Menderes; famous for its many windings; 240 mi. to its mouth at Miletus: *map* G-154

Means, Florence Crannell (born 1891), author of books for girls, born Baldwinville, N.Y. ('Candle in the Mist'; 'Shuttered Windows'; 'Adella Mary in Old New Mexico'; 'Shadow Over Wide Ruin').

Mean solar day D-21, T-94

Mean solar time T-94

Mean variation, in statistics I-72

Meares, John (1756?-1809), English navigator; explored coast of Alaska; sailed to China by way of Hawaiian Islands

Columbia River O-246

Mearne, Samuel and Charles, English bookbinders B-183

Measles, a contagious disease common among children G-78 control, *pictograph* H-255

"Measly beef" W-180a

Measure (arithmetic), a method of division D-73, 74

Measure, in music, the notes between two bars. The measure represents a unit of rhythm since each measure has but one principal accent.

'Measure for Measure', comedy by Shakespeare in which Angelo, deputy for Vincentio, duke of Vienna, plots against Claudio and Isabella. The duke, disguised as a friar, rescues Isabella from Angelo's intrigue, saves her brother Claudio from execution, then, in his own character, weds Isabella and compels Angelo to marry his jilted sweetheart, Mariana

chronology and rank S-100c

Measurements and tests. *See* in *Index* Achievement tests; Intelligence tests

'Measure of the tithe', in feudal system, *picture* F-30

Measures W-66-9. *See also* in *Index* Weights and measures

Measures of central tendency G-136f-g

Measuring, or mensuration, in mathematics M-115-17

Measuring devices, tools, T-112

calorimeter B-272

micrometer M-155

pendulum, for force of gravity at sea, *picture* P-108

Measuring worm, or cankerworm C-72

Meat M-96-101. *See also* in *Index* Meat packing; Poultry

Arctic regions A-278

beef: cuts, *pictures* M-101; dried D-39; principal beef cattle C-104-5; standards C-106

buffalo B-148, 150

cooking C-351

digestion of proteins P-356, D-68, 69

food value F-145: calories, *table* F-144b; compared to milk, *chart* M-172

market in Tunis, *picture* F-142

mutton S-106, *picture* S-105

pork H-314-16

preservation A-223: cold storage M-98, *picture* M-100; creosote for C-394

Meath, county of n.e. Ireland, in Leinster Province; area 903 sq. mi.; pop. 61,000; originally a kingdom with greater territory, which existed until 12th century.

Meat packing M-96-101

by-products M-97, H-315: buttons B-288; fats F-18-19; fertilizer F-27; gelatin G-25; glue G-107-8; oleomargarine O-221-3

cold storage M-98, *picture* M-100: shipping methods R-67-8

government inspection M-98, *pictures* M-99, 100, 101

government restrictions T-146

slaughtering process M-97

South American production: Argentina A-280b; Uruguay M-248

stockyards, description M-96-7, *pictures* M-96-101, C-188

U.S. centers M-98, H-316: Buffalo B-261; Chicago M-96, *pictures* M-96-7, C-188; Cincinnati O-212; Kansas City K-6; Omaha O-225, *pictures* N-59; St. Paul S-11

Meat's, of ear, *diagram* E-127

Meaux (*mō*), France, town on Marne River 20 mi. e. of Paris; pop. 14,000; marked closest approach to Paris of Germans in 1st World War; farming and milling center.

Mee'ca, or Mekka, holy city of Mohammedans, one of two capitals of Kingdom of Saudi Arabia, near Red Sea; pop. 85,000: M-103, A-237, *map* A-242, *pictures* M-102

fairs F-4

Mohammed M-213, *picture* M-215

reforms of Ibn Saud A-241

Mechanical drawing D-101-3, D-99

Mechanical engineering E-267, 268 as vocation V-321: beginning I-74j

principles and laws P-190-3, M-103-6

Mechanical equivalent of heat P-194

Mechanics, branch of physics dealing with force and motion and the mechanical properties of solid, liquid, and gaseous matter M-103-6, P-190-3, *Outline* P-196

arch principle A-249

centrifugal force C-134

Galileo's contributions G-1-2

gravitation G-142

gyroscope G-191-2

inventions I-116

Newton's contributions N-110-2, G-140-3

planetary motion K-15

practical applications, *Outline* I-78

tools and machines T-108-12

Mechanicsville, village 7 mi. n.e. of Richmond, Va., where Federals repulsed Confederates in bloody battle June 26, 1862; first of Seven Days' battles of Peninsular Campaign; also called Beaver Dam Creek.

Mechanization, army A-307c, A-388, *picture* A-306

- Mechaviator, or auto-pilot, for airplanes A-76, 78, *pictures* A-384, A-77  
 gyroscopic principle G-191-2  
 Mechelen (*mēk'ē-lēn*), also Mechlin (*mēk'lin*), Belgium. *See in Index* Malines  
 Mech'nikov, Elie. *See in Index* Metchnikoff  
 Mecklenburg (*mēk'lēn-burk*), state in n. Germany, formed by union of Mecklenburg-Schwerin and Mecklenburg-Strelitz in 1934; area 6197 sq. mi.; pop. 805,000; grand duchies, became republics 1918; placed under absolute rule of governor 1933.  
 Mecklenburg Declaration of Independence N-159, F-92  
 Mecoptera, an order of insects consisting of the scorpion flies and their allies; winged members have four wings.  
 Médaille Militaire (*mā-dā'yū mē-lē-tēr'*), French military medal D-32  
 Medal for Merit, U.S. D-32  
 Medal of Honor, U.S. Army, also called Congressional Medal D-31, *color plate* D-33  
 Medal of Honor, U.S. Navy D-31, *color plate* D-33  
 Medal play, in golf G-118  
 Medals D-31-2, *color plate* D-33  
 Medan, Sumatra, commercial city in n.e. part of island, pop. 75,000: *map* A-332c  
 Medary, Marjorie (born 1890), author of children's books, born Waukon, Iowa; 'Prairie Anchorage' and 'College in Crinoline' are pioneer stories; 'Toppallant' is story of a herring gull.  
 Medea (*mē-dē-ā*), in Greek mythology, enchantress who aided Argonauts A-282  
 Medellín (*mā-dēl-yēn'*), one of chief cities of Colombia; gold and silver mining and manufacturing center, 150 mi. n.w. of Bogotá; pop. 178,000; university, school of mines: C-306, *map* C-305  
 Medes (*mēdz*), ancient Indo-European people of Caspian region M-107  
 conquer Nineveh N-146, B-8  
 Persians and P-133-4  
 warfare, methods A-307f  
 "Medfly." *See in Index* Mediterranean fruit fly  
 Medford, Mass., suburb 5 mi. n.w. of Boston on Mystic River, chiefly residential; pop. 63,083; Tufts College; Craddock House (1634), one of the oldest buildings in U.S. which retains original form.  
 Medford, Ore., city in s.w. about 22 mi. from California line in rich fruit-growing and dairying country; pop. 11,281; lumber, cement, and brick, canned goods, creamery products; tourist center: *map* O-246  
 Me'dia, ancient kingdom and country now included in n.w. Persia; home of Medes M-107  
 Median, in statistics G-136g  
 Mediation, friendly intervention by a third party (or power when applied to international law) in effort to settle a dispute  
 industrial L-44c, A-247  
 international A-246  
 Medical Department, U.S. Army A-307a-b, U-224  
 insignia, *picture* U-178  
 Medici (*mēd'i-chi*, Italian *mā'dē-chē*), famous Florentine family M-107, F-108. For individual members *see in Index* under Christian names, as Catherine de' Medici  
 Palazzo Vecchio I-169, *pictures* I-169, I-171  
 Savonarola opposes S-33  
 Medicinal leech L-93  
 Medicine, god of, Aesculapius H-370  
 Medicine and surgery M-108-109. *Outline* P-207-9. *See also in Index* Anatomy; Disease; Hygiene; Physiology  
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 various schools M-109: osteopathy O-253  
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 Medicine Bow Mountains, a range of the Rockies in Colorado and Wyoming; highest point 12,005 ft.: *maps* C-310, W-194  
 Medicine Hat, Alberta, industrial and agricultural center in s.e. on South Saskatchewan River; pop. 9592; flour-milling and coal-mining interests: *map* C-50b  
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 Medicine man, among savage tribes, one who professes to cure disease by sorcery M-109, M-32, 32a  
 African witch doctor, *pictures* M-30, 32  
 North American Indians F-10: initiation, *picture* I-65; method of cure I-64  
 use of picture writing I-63  
 Medieval period. *See in Index* Middle Ages  
 Medill, Joseph (1823-99), American journalist, born New Brunswick, Canada; chief owner and editor, Chicago Tribune, which under his direction grew into important and influential paper; ardent supporter of anti-slavery movement; mayor of Chicago 1871-3.  
 Medina (*mē-dē-nā*), José Toribio (1852-1930), Chilean writer L-67i, u  
 Medina (*mē-dī-nā*), holy city in cent. Hejaz, Saudi Arabia, 110 mi. e. of Red Sea; much visited by Mohammedan pilgrims; pop. 20,000: *map* A-242  
 Ibn Saud conquers A-240  
 Mohammed at M-213-14  
 Medina Sidonia (*mā-dē-nā sē-dō-nyū*), Don Alonso Perez de Guzman, 7th Duke of (1550-1615), Spanish admiral; made commander of the Spanish Armada by Philip II because of his noble rank; his lack of naval training and ability were factors in bringing about defeat of Armada by English in 1588.  
 Mediotar'sal arch, or transverse arch, of the foot F-148  
 'Meditations', work by Marcus Aurelius M-63  
 Mediterranean climate C-270b  
 Mediterranean fever, or Malta fever, a fever of bacterial origin; occurs chiefly in Mediterranean region, occasionally in tropical America.  
 Mediterranean fruit fly, or "medfly," a destructive insect (*Ceratitis capitata*); attacks fruit, nuts, and vegetables; yellow, black, and white markings: F-129  
 Florida's fight against I-90  
 Mediterranean race R-10  
 Aegean civilization A-26-7  
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 Mediterranean Sea, between Europe and Africa; 1,145,000 sq. mi.: M-109-110, E-316, *maps* A-42a, b, B-18. *See also* Ocean, table  
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 Greek civilization G-153  
 Greek colonies G-156  
 Mediterranean wheat, in U. S. A-53  
 Medium, in spiritualism S-259  
 Medjidie (*mē-jē-dī-ē*), a Turkish silver coin worth 20 piasters or a later gold coin worth 100 piasters.  
 Med'lar, a tree (*Mespilus germanica*) of the rose family; a native of s. Europe and w. Asia; fruit resembles a small apple and is good to eat only after it has begun to decay.  
 Medul'la oblonga'ta, part of spinal cord just below the brain B-219, *picture* B-220  
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 Medusa (*mē-dū'sā*), in Greek mythology, one of the Gorgons P-127-8, *picture* S-58  
 Pegasus sprung from P-100  
 Medusa, or jelly-fish J-209-10  
 example of primitive nervous system, *photograph* N-64a  
 Medway, navigable river in s.e. England, joining Thames at Sheerness near mouth; length 60 mi.  
 Mee, Arthur (born 1875), English editor and author; editor *My Magazine*, *The Children's Newspaper*, 'Harmsworth's Self-Educator', 'Harmsworth's History of the World', 'Book of Knowledge', 'Harmsworth's Popular Science'; author 'Letters to Boys', 'Letters to Girls'. For list of articles in this work by Arthur Mee *see in Index* Little Talks on Great Things  
 Meeker, Ezra (1830-1928), American pioneer and author, born Huntsville, O.; drove ox-team over Oregon Trail to Northwest 1852; returned with ox-team at age of 76; for 50 years a farmer in Washington ('Ox-Team Days').

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, there; ice, bīt; rōw, wōn, fōr, nōt, dō; cāre, būt, rȳde, fȳll, būrn;

- Meer, Jan van der. *See in Index* Vermeer
- Meerscham (mēr'sham), a clay-like mineral used chiefly for pipes M-110 chemical composition M-184
- Meerut (mēr'ūt), town in n. India 35 mi. n.e. of Delhi; pop. 135,000; cotton trade; here Sepoy mutiny first broke out (1857): map A-332c
- Megacycle, a million cycles.
- Megadyne, physical unit, one million dynes.
- Megaera (mē-gēr'a), in Greek mythology, one of Furies F-218
- Megaliths, huge blocks of rough-hewn stone used by early peoples in building M-48
- Stonehenge S-293, picture M-48
- Megalopolis (mēg'ā-lōp'ō-lis), ancient Greek walled city in Peloponnesus; founded by Epaminondas (370 B.C.) as capital of Arcadian confederacy; sacked by Spartans (222 B.C.).
- Megalosaur, an extinct reptile A-206
- Megaphone, how it increases sound S-196
- Greek device for actors T-76
- Megapodes, or mound birds, family of Australian birds that do not brood their eggs E-192
- Megara (mēg'ā-rā), in Greek mythology, first wife of Hercules, whom he gave to his friend Iolaus, when he wished to marry the daughter of King Eurystus.
- Megara, capital of Megaris, small district of ancient Greece w. of Attica; founded many colonies
- Athenians take Salamis from S-192
- Mège-Mouries (mēzh mgr-ē'), Hippolyte, French chemist, inventor of oleomargarine O-221
- Megiddo (mē-jīd'ō), ancient, fortified city in Palestine on border of plain of Esdraelon; mentioned in Amarna letters and frequently in the Bible; said to be origin of word, Armageddon; original walls built before 2000 B.C.; scene of famous battle (1479) in which Thutmose III of Egypt defeated confederated kings of Syria and Mesopotamia.
- Meg Merrilies, old gipsy woman in Scott's 'Guy Mannering' S-50
- Mehadia (mā-hū'dē-ā), town in s.w. Rumania, famous for Hercules baths, known to Romans.
- Meharistes, French camel police of Sahara Desert A-34
- Mehemet Ali (mā'hē-mēt ā'lē) (Mohammed Ali) (1769-1849), viceroy of Egypt; massacred Mamelukes (1811); conquered Syria, but was compelled by European powers to give it up in 1841; did much to develop Egypt: E-200
- Meighen (mē'en), Arthur (born 1874), Canadian statesman, born Anderson, Ontario; premier (1920-21, 1926).
- Meigs (mēgz), Cornelia Lynde (born 1884), American author, born Rock Island, Ill.; writer of fantastic and historical adventure stories for young people 'Covered Bridge'; 'Trade Wind'; 'The Wonderful Locomotive'; 'Clearing Weather'; 'The Crooked Apple Tree'; 'Invincible Louisa', awarded Newbery medal (1934).
- Meikle (mēk'l), Andrew (1719-1811), Scottish inventor of threshing machine T-86
- Meiklejohn (mīk'l-jōn), Alexander (born 1872), American educator, born England; professor of philosophy and dean, Brown University 1901-12; president Amherst College 1912-24; professor philosophy and director of experimental college, University of Wisconsin, 1926-38.
- Meilhac (mē-yāk'), Henri (1831-97), French dramatist, born Paris; collaborated with Ludovic Halévy on operettas, farces, and comedies about the foibles of Parisian society; music for the operettas was composed by Offenbach ('La Belle Helène'; 'La Grande Duchesse'; 'Barbe Bleue').
- Meinesz, F. A. V., Dutch scientist, inventor of special pendulum, picture P-108
- 'Mein Kampf', by Adolf Hitler, first published 1925; several revised editions; translated into many languages, including Chinese; total circulation in millions: H-311, W-178b
- Melosis (mī-ō'sis), a figure of speech F-33
- Melosis, or reduction division, in biology, a type of cell division, picture H-283b
- Meirelles (mā-rū'lis), Victor (Victor Meirelles de Lima) (1832-1903), Brazilian painter; famous for historical canvases and panoramas of Rio de Janeiro.
- Meissen (mī'sēn), Germany, town in Saxony on Elbe River 15 mi. n.w. of Dresden; pop. 45,000; 13th century cathedral: picture G-72
- Dresden china P-332, picture P-335
- Meissonier (mē-sōn-yā'), Jean Louis Ernest (1815-91), French painter; highly realistic historical, military, and genre subjects; one of best miniature painters in France; exceptional attention to details ('Friedland 1807'; 'Les Cuirassiers'; 'Napoleon III at Solferino').
- Meister Dill, or TILL. *See in Index* Riemenschneider, Tilman
- Meistersinger (mīs'tēr-zing-ēr), "master singer" M-310
- 'Meistersinger von Nürnberg, Die' (dē mīs'tēr-zing-ēr fōn nūrn'berk), opera by Wagner O-232, W-1
- Mecca. *See in Index* Mecca
- Mek'nes (mēk'nēs), or Mekinez, town in n. Morocco, about midway on railway between Fez and Rabat; pop. 75,000; walled "old" town has Sultan's summer palace and Mulai Ismail mosque; new town a trade center: map A-42a
- Mekong (mā-kōng') River, in s.e. Asia; rises in Tibet, flows 2600 mi. into China Sea; forms greater part of boundary between Thailand and French Indo-China; also called Cambodia River: map A-332c
- Melac'onite, a blackish ore of copper occurring in Lake Superior district and Mississippi valley; known chemically as cupric oxide: C-361
- Melanchthon (mē-lāngk'thōn), Philipp (1497-1560), German religious reformer, friend and ally of Luther, and through his broad-minded tolerance, learning and clear thought, the peacemaker and scribe of the Protestant Reformation: R-65
- Melane'sia, division of Pacific Islands P-3-4, map P-10b-c
- Melanesian race, or Papuan race P-4
- East Indies E-142b-c
- New Guinea N-84
- racial affinity, diagram R-9b
- Mel'anism, an excess of black pigment in the skin or in plumage or pelage; opposite of, and less frequent than, albinism.
- Melba, Nellie (Nellie Porter Mitchell) (1859-1931), world-famous Australian prima donna; debut at age of six at Melbourne, city from which she took her name; exceptionally pure and flexible coloratura soprano voice; fascinating personality (Lucia in 'Rigoletto'; Elsa in 'Lohengrin'; Michaela in 'Carmen'; Marguerite in 'Faust') as Marguerite, picture O-232
- Melbourne (mēl'būrn), William Lamb, Viscount (1799-1848), English statesman, premier 1834, 1835-41, Queen Victoria's first guide and mentor in statecraft: V-295, 296
- quoted on Macaulay M-2
- Melbourne, cap. of Victoria, Australia; pop. 1,000,000: M-110-11, A-374, maps A-372a, b, pictures M-111, A-370
- Melcher, Frederic G. (born 1879), editor, born Malden, Mass.; co-editor *The Publishers' Weekly* after 1918; president R. R. Bowker Co.; established Newbery and Caldecott awards.
- Melchers (mēl'kērz), Gari (1860-1932), genre, mural, and portrait painter, born Detroit; lived most of life in Europe; interpreter of motherhood ('Mother and Child'; 'The Sermon'; 'The Pilots'): P-29
- pioneer woman, picture P-221b
- Melchett, Alfred Moritz Mond, first Baron (1868-1930), British politician and business man; minister of health; chairman, Economic Board for Palestine.
- Melchior (mēl'ki-ōr), one of the Wise Men of the East. *See in Index* Magi
- Melchior, Lauritz (born 1890), Danish tenor; debut with Copenhagen Royal Opera, 1913; famous for his Wagnerian rôles at Bayreuth Festival and with Metropolitan Opera, New York City.
- Melchisedek (mēl-kīz'ē-dēk), in Bible, king of Salem and priest of God, who blessed Abraham (Gen. xiv. 18). Jesus is called a priest "after the order of Melchisedek" (Heb. vii. 1-21).
- Meleager (mēl-ē-ā'jēr), Greek writer and collector of epigrams; compiled, about 60 B.C., a collection of his own and others' writings to form the first 'Greek Anthology'.
- Meleager, in Greek mythology, a famous hero, son of Oeneus, the Calydonian king; took part in the expedition of the Argonauts; killed the giant boar of Calydon.
- Melegnano (mā-lān-yā'nō), Italy. *See in Index* Marignano
- Meleguetta pepper, or grains of paradise, a spice made from the seeds of plants of genus *Amomum*.
- Melibeus and Prudence, in 'Canterbury Tales' C-161
- Melilla (mā-lēl'yā), Spanish fortified station and penal settlement on n. coast of Morocco; pop. 62,000.
- Mello'tus, scientific name of sweet clover C-281, 282
- Mel'inite, a high shell explosive, chiefly picric acid.
- Melipo'nes, stingless social bees B-77
- Mélsande (mā-lē-zānd'). *See in Index* 'Pelléas et Mélisande'
- Melissa. *See in Index* Balm
- Mellette, Arthur Calvin (1842-96), American politician, born Henry County, Ind.; as member Indiana state legislature, 1871, credited with laying foundations of township school system; last territorial governor of Dakota appointed 1889; first governor of South Dakota.
- Mellon, Andrew William (1855-1937), American financier, born Pittsburgh, Pa.; prominent in industrial development of Pittsburgh; with brother founded Mellon Institute of Industrial Research; as secretary

ü=French u, German ü; gem, fō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); κ=German guttural ch



- of treasury under Presidents Harding, Coolidge, and Hoover had part in funding of war debts and management of national debt; United States ambassador to England 1932-33; in 1937 presented \$50,000,000 art collection to the United States. *See in Index* National Gallery of Art
- Mellon, Richard Beatty (1858-1933), American banker, born Pittsburgh, Pa.; brother of Andrew Mellon; president. Mellon National Bank.
- Mellon Institute of Industrial Research, founded at University of Pittsburgh by Andrew W. Mellon and his brother to make scientific research available to industry.
- Melo'deon, an American reed-organ; its reeds are sounded by an inward air current produced by exhaust bellows; about 1850 supplanted the English harmonium, whose reeds are sounded by an outward current from compression bellows: O-250, *picture* M-322
- Melodic scale, in music S-198
- Melodrama, from two Greek words meaning song and drama; originally a dramatic composition with musical accompaniment; later a popular, sensational play with extravagant situations and conventionalized heroes and villains.
- Melody, in music M-319
- Melon M-111-2  
when and how to plant G-13
- Meloria, battle of (1284) P-223
- Melos (*mē'lōs*), formerly Milo, mountainous Greek island 75 mi. e. of S. Greece; 52 sq. mi.; exports sulphur, manganese; Venus of Milo found here in 1820: *map* B-18
- Melos, Venus of, statue A-227, G-166, E-328, *pictures* E-333, A-227
- Melozzo da Forlì (*mā-lōt'sō dā fōr-lē*) (1438-1494), Italian artist of early Umbrian school; one of first to create illusion of unbounded space (vault of Santi Apostoli in Rome).
- Melpomene (*mēl-pōm'ē-nē*), in Greek mythology, one of the Muses M-305, *picture* A-228
- Melrose, Mass., residential suburb 8 mi. n. of Boston; pop. 25,333; Boston baked beans; settled 1632.
- Melrose Abbey, Scotland, in town of Melrose, 32 mi. s.e. of Edinburgh: *picture* M-232
- heart of Bruce buried at B-252
- Melrose Park, residential and industrial suburb of Chicago; pop. 10,933; railroad shops; steel manufactures; airplane engines.
- Melting point, of solids F-193, 194, W-43, P-194, *table* F-194
- "low melting point" alloys A-132
- metals M-122
- platinum P-246
- sulphur S-323
- tungsten T-150
- "Melting pot," why U. S. is so called U-181, A-161
- Melton, a thick, smooth, heavy woolen fabric used for overcoats; named from Melton-Mowbray, a fox-hunting resort in England.
- Melun (*mū-lūn'*), France, manufacturing and railroad center on island and on both banks of Seine River 28 mi. s.e. of Paris, pop. 18,000.
- Melusina (*mēl-ū-sē'nā*), or Mélusine (*mā-lū-sē'n'*), in French legend, a beautiful fairy who was changed every Saturday into a fish or serpent from the waist down; upon being observed in this form she disappeared and wandered thenceforward as a ghost.
- Melville, George W. (1841-1912), American admiral, scientist, and polar explorer; member of Jeanette polar expedition (commanded by De Long) and commander of survivors; member of Greely relief expedition; engineer-in-chief of the Navy 1887-1903.
- Melville, Herman (1819-91), American author, born New York City; went to sea at 18; after seven years (including two years on Pacific whaling vessel) returned to New York and was in turn school teacher, farmer, and customs inspector, writing in spare time ('Typee' and 'Omoo', earliest and among the best tales of the South Seas; 'Moby Dick', or the 'White Whale'; 'White Jacket', which effected abolition of flogging in U.S. Navy): A-179
- illustration of 'Moby Dick', *pictures* W-77, H-313
- Melville Island, Australia, off center of n. shore; 2400 sq. mi.; densely wooded, especially with eucalyptus trees: *map* A-372a
- Melville Island, uninhabited Canadian island of Arctic regions n. of Victoria Island; 20,000 sq. mi.: *maps* C-50b, N-150b
- Melville Peninsula, Canada, 400 mi. n. of Hudson Bay between Gulf of Boothia and Foxe Channel; 25,000 sq. mi.: *map* C-50c
- Membrane, a thin layer of tissue in an animal body. Fibrous membrane, with parallel fibers, provides attachments or support. Serous membrane, with smooth surface, lines or covers organs to prevent binding and friction. Mucous membrane lines organs directly or indirectly open to the air; its glands and cells secrete a protective and lubricating fluid, the mucus.
- Memel (*mā'mēl*) Territory, n.e. border of East Prussia, along Niemen River to Baltic Sea; area 1099 sq. mi.; pop. 152,000; chief city, Memel, fortified Baltic port; pop. 38,545. Territory taken from Germany by Peace Conference, 1919; given to Lithuania, 1924, as outlet to sea; ceded to Germany, 1939, with free port zone for Lithuania.
- Memel River. *See in Index* Niemen River
- Mem'ling, or Memline, Hans (1430?-94), Flemish painter of portraits and religious subjects which he rendered with exquisite color and modeling and lifelike expression (paintings for shrine of St. Ursula at Bruges, Belgium; 'Marriage of St. Catharine'; 'Christ, the Light of the World').
- Mem'on, in Greek mythology, son of Eos and king of Ethiopians M-112
- Memnon, Colossus of M-112, E-208, *picture* E-209
- 'Memorabil'in' of Xenophon X-197
- Memorial Day M-112, H-320-1
- Mem'ory M-113, P-360
- association M-113, P-360
- child, development in C-200
- hypnotism, effect of H-377-8
- learning, factor in L-79-82
- recall M-113; in writing W-186
- study, place in S-309-10
- Mem'phis, early capital of Egypt at apex of Nile delta s. of Cairo, now in ruins E-203, *maps* B-8, E-197
- Memphis, Tenn., largest city of state; pop. 292,942: M-114, *map* T-46, *picture* T-45
- La Salle builds fort T-48
- Memphremagog (*mēm-frē-mā'gōg*), Lake, in s. of Quebec province, Canada, and N. Vermont; 1 to 4 mi. wide and 30 mi. long: *map* N-86
- Mennai (*mēn'i*) Strait, narrow channel (spanned by bridge) separating island of Anglesey from Wales.
- Menam (*mā-nām'*) River, chief river of Thailand, flowing s. from Burma 750 mi. and entering Gulf of Siam by several mouths: T-73a
- Menan'der (342-291? B.C.), Greek dramatist D-93
- Menangkabau, the most advanced of Malay peoples, living in mountains of central Sumatra; believed to be first conquerors of island: F-11
- Ménard (*mā-nār'*), René (1605-61), Jesuit missionary in upper Great Lakes region; born Paris, France; suffered brutal treatment by Iroquois and Ottawa; lost life when going to aid starving, fugitive Hurons in Wisconsin near Lake Superior border: G-150a
- Menasha, Wis., city on Lake Winnebago, 5 mi. s. of Appleton; pop. 10,481; woodenware, printing and publishing, paper: *map* W-124
- Men-at-arms, medieval soldiers A-308
- Meneius (*mēn'shūs*), or Meng-tse (372?-299? B.C.), Chinese philosopher and follower of Confucius; taught that man is by nature good, that government should exist for the people, that war is unjust and unnecessary ('Works') 'Four Books' C-221g
- Menck'en, Henry Louis (born 1880), American editor, critic, and essayist, born Baltimore; became journalist at 19; outstanding for sharp, satirical criticisms of American customs and ideals; editor of *The Smart Set* 1914-23, and of *The American Mercury* 1924-33 ('Prejudices'; 'In Defense of Women'; 'The American Language'; 'Treatise on the Gods'): A-183
- Men'del, Gregor (1822-84), Austrian priest and biologist, abbot of Brunn; discoverer of 'Mendel's law' of heredity: H-284, B-115, *photographs* H-283a-b
- Mendel, Lafayette B. (1872-1935), chemist and biologist, born Delhi, N. Y.; pioneer in vitamin research.
- Mendeléeff (*mēnd-yē-lā'ēf*), Dmitri Ivanovitch (1834-1907), Russian chemist, *picture* C-169
- periodic law of chemical elements C-167b, *chart* C-168
- Mendel's law of heredity H-284, B-115, *photographs* H-283a-b
- Mendelssohn (Mendelssohn-Bartholdy) (*mēn'dēl-sōn bār-tōl-dē*), Felix (1809-47), German musician and composer M-114, M-314
- Mendelssohn, Moses (1729-86), German (Jewish) philosopher, original of Lessing's 'Nathan the Wise', and grandfather of the musician Felix Mendelssohn: J-217
- Menderes (*mēn'dēr-ēr*) River. *See in Index* Meander
- Mendès (*mān-dēs'*), Catulle (1841-1909), French poet and novelist, one of Parnassian group; a versatile and accomplished writer ('Histoires d'amour'; 'Le roi vierge', novel).
- Mendicant Orders, monastic societies depending upon alms for support M-234
- Mending, of clothing S-90-1
- Mendip Hills, England, range 6 mi. wide and 20 mi. long in W. Somersetshire; highest point 1067 ft.; stalactite caves; Roman remains.
- Mendoza (*mān-dō'sā*), Antonio de (1485-1552), Spanish administrator; first viceroy of New Spain, or Mexico; later viceroy of Peru: S-221

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yāt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŭde, fŭll, būrn;

Mendoza, Don Pedro de (1487?-1537). Spanish captain, colonizer of Plata River region in Argentina.

Mendoza, Argentina, capital of province of Mendoza, at foot of the Andes, 600 mi. n.w. of Buenos Aires; chief center for trade with Chile; grape, fruit, and wine industries; pop. over 80,000; 10,000 lives lost in earthquake of 1861: maps A-279, S-208c

Menelaus (*mēn-ē-lā'ūs*), in Greek mythology, king of Sparta, brother of Agamemnon and husband of Helen tricked by Proteus P-356

Men'elik II (1844-1913), emperor of Ethiopia, 1889-1909; able and enlightened ruler; forced recognition of Ethiopian independence from European powers war with Italy E-309

Menéndez de Aviles (*mā-nēn'dāth dā ā-vē-lās'*), Pedro (1519-74), Spanish explorer

Florida coast explored, map F-111 Fort Caroline captured by F-110 St. Augustine founded by S-6

Menes (*mē'nēz*), first of historical kings of Egypt; united Upper and Lower Egypt: E-203

Mengelberg (*mēng'ēl-bērck*), Willem (born 1871), Dutch orchestral conductor, born Utrecht, conductor Concertgebouw Orchestra, Amsterdam, one of finest orchestras in Europe, and of New York Philharmonic Orchestra.

Meng-tse. See in Index Mencius

Menha'den, or pogy, an oily fish of the herring family H-287, F-82 young sold as sardines S-28

Menhirs (*mēn'hērz*), prehistoric monuments S-293

Meniscus, curved surface of liquid formed by capillarity, picture W-45

Menkaura (*mēn-kə'rā*). See in Index Mycerinus

Menken, Adah Isaacs (1835-68), American actress, born New Orleans, La.; began career as ballet dancer; won fame as Mazeppa in play based on Byron's poem.

Men'to Park, N.J., village 14 mi. s.w. of Newark, site of Edison's laboratory E-161

Menninger, Karl Augustus (born 1893), psychiatrist and writer, born Topeka, Kan.; assistant in neuropathology, Harvard, 1918-20; psychiatrist at Menninger (Neuropsychiatric) Clinic, Topeka, Kan. ('The Human Mind'; 'Man Against Himself')

Men'nonites, Protestant denomination growing out of Anabaptist movement in 16th century; opposed to oath-taking, military service, and theological learning; hold to simplicity of life and worship and often live in separate communities; named from Menno Simons, leader in Netherlands; membership in U. S. about 117,000

Buttons forbidden B-286 Pennsylvania settlement P-116

Men'no Si'mons (1496-1561), founder of later school of Anabaptists in Netherlands, from whom Mennonites took their name.

Menoher, Charles Thomas (1862-1930), major general, U.S. Army, retired 1926; commanded 42d (Rainbow) Division in 1st World War; director U.S. Army Air Service 1919-21.

Menominee, Mich., city on Green Bay opposite Marinette, Wis., at mouth of Menominee River; pop. 10,230; lumber, furniture, baby carriages: map M-153

Menominee (*mē-nōm'i-nē*) Indians, an Algonquian tribe of North American Indians formerly living about the Menominee River in upper Michigan and n. Wisconsin but now on a reservation near Green Bay, Wis. The name means "wild rice men" and refers to what was formerly their chief food

houses I-59 Menominee River, formed by union of Michigamie and Bois Brulé rivers on boundary between Wisconsin and upper Michigan; flows s.e. 125 mi. to Green Bay: map M-153

Menshiviki (*mēn-shiv-ē-kē*), minority of Russian Social Democrats, opposed to Bolshevism B-170

Mensuration, or measuring, in mathematics M-115-7

Mental deficiency M-117-18 heredity M-118, H-283-6

measured by intelligence tests I-96-7 Mental hygiene M-118

emotional control E-262 Mental tests I-96-7, P-362, C-201

individual differences I-71-3 Mental therapy, or mind cure P-361,

362, M-109 hypnosis used in H-378

Men'tha, the genus of mint plants M-195-6

Men'thol, or mint camphor, a crystalline substance obtained from essential oil of peppermint, used in making local applications for the relief of itching or pain.

Mentone (*mēn-tō'nā*), French Menton (*mān-tōh'*), town in s.e. France, on Mediterranean, about 14 mi. n.e. of Nice; pop. 22,000; protected on n. and w. by mountains, it is a favorite winter resort for invalids.

Men'tor, in Greek mythology, friend of Odysseus and guardian of his son Telemachus; hence a wise counselor.

Menuhin (*mēn'ū-in*), Yehudi (*yū-hg'-dī*) (born 1916), violinist, born New York City; a child prodigy, made debut at 7 with San Francisco Orchestra; afterward studied in Paris with Enesco; at 11 played Beethoven, Bach, and Brahms with Berlin Philharmonic Orchestra.

Menzel (*mēnt'sēl*), Adolph von (1815-1905), German artist; famous for series of pictures, 'The Life of Frederick the Great', but best work found in many paintings of daily life; revived art of lithography and wood engraving and was one of the best illustrators of his day.

Mephistopheles (*mēf-is-tōf'ē-lēz*), an evil spirit, personification of the devil, in the Faust legends F-19-20, G-110, picture O-230

Meramee River, in s.e. Missouri; flows n.e. to Mississippi near St. Louis: map M-208

Merano (*mā-rān'ō*), town in Bolzano province, Italian Tyrol, formerly in Austria; noted as health resort.

Merauke (*mē-rou'kē*), Dutch New Guinea, capital and seaport on s. coast: pop. 20,000; map E-143

Mercantile system, or mercantile theory C-322-3, I-110c, A-159 American colonies R-85, A-159

Mercantini (*mēr-kān-tē'nē*), Luigi (1821-72), Italian poet, author of 'Garibaldi Hymn'.

Mercator (*mēr-kāt'ēr*), Gerard (1512-94), Flemish geographer and map-maker; originated "Mercator's projection" of the globe.

Mercator's projection M-59

Merced, Calif., city 65 mi. s. e. of Stockton, in fruit-growing region;

pop. 10,135; principal motor and rail gateway to Yosemite National Park; canned fruits, lumber: map C-28

Merced River, rises in Sierra Nevada in e. cent. California and flows 160 mi. s.w. to Joaquin River Yosemite Valley Y-207

Mer'cer, John, English inventor of mercerizing process M-118

Mercerizing, process which gives silky finish to cotton M-118-19

Mercersburg, Pa., borough in s. cent. part of state; pop. 1763; formerly seat of noted German Reformed church seminary; early home of President Buchanan.

Mercer University, Baptist at Macon, Ga.; founded 1833; liberal arts, law, commerce, education, Christianity, journalism; graduate school.

Merchandise Mart, Chicago C-190, picture C-189

Merchant Adventurers, Company of R-76-7

Merchant Fleet Corporation, established 1917 as Emergency Fleet Corporation; transferred to U. S. Maritime Commission 1936.

Merchant gilds G-88

trained apprentices E-172

Merchant marine, commercial vessels as distinguished from the military marine, or navy

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sailing vessels S-118, 120, pictures S-125

United States history S-129, 122, pictograph S-128b; decline C-323

modern types of ships S-128 sailing vessels S-118, 120, pictures S-125

Seamen's Act S-129-30

Shipping Board fosters U-231 tonnage, pictographs S-128a, b

World War, 1st W-170

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Merchant Marine Act of 1936, United States S-123

Merchant Marine Distinguished Service Medal D-32

'Merchant of Venice', comedy by Shakespeare M-119

chronology and rank S-100e

quotations from M-119, S-100b

Merchants Exchange, in early New York, picture U-240

Merchants of the Staple, English commercial organization R-76-7

Merchant's tale, in 'Canterbury Tales' C-162

Mercia (*mēr'shī-ā*), an Anglo-Saxon kingdom in central England, 6th to 9th centuries; in 8th century was most powerful of all the kingdoms.

Mercier (*mērs-yā'*), Désiré Joseph, Cardinal (1851-1926), Belgian prelate and patriot M-119

Mercier, Honoré (1840-94), Canadian lawyer and statesman; became leader of Liberal party 1883; premier and attorney general 1887; extremely popular in his native province of Quebec until 1891 when charges of corruption (of which he was acquitted) were brought against him in connection with railway subsidies.

"Merciless Parliament," of Richard II R-104

Mercuric chloride, or bichloride of mercury M-120

Mercurochrome, a penetrating antiseptic made by combining fluorescein, an aniline dye of strong penetrating power, with mercury,

which has great bactericidal properties.

**Mercurous chloride** (calomel) M-120  
**Mer'cury**, or **Mercur'ius**, in Roman mythology, the messenger of the gods, and god of thieves and merchants; identified with Greek **Hermes**: H-286. *See also in Index* **Hermes** **Odin** identified with O-202

**Mercury**, a planet P-230, diagrams P-230, 231, table P-231  
 eccentricity P-233  
 orbital shift computed by **Einstein** E-213

**Mercury**, or **quicksilver**, called in Latin and chemistry **hydrargyrum**, a fluid metallic element M-119-20, C-176, table C-168  
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arc (Cooper-Hewitt) lamp E-234  
 barometers B-49-50, picture B-48  
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electric switch, picture A-386  
 electrochemical activity E-239  
 freezing and boiling points M-120  
 fulminate, a high explosive E-347  
 gold separated from ore by G-112, picture A-371

mercuric and mercurous compounds distinguished C-176  
 mineral forms M-182  
 mirrors formerly employed M-199  
 producing regions M-119-20: **Arkansas** A-295; **Mexico** M-141  
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 uses M-120  
 vapor M-120: electric signs E-238; lamps R-15, Q-3, picture H-371; pumps, to create vacuum V-268  
 weight M-119, I-134

**Mercurio** (*mēr-kū'shī-ō*), in Shakespeare's 'Romeo and Juliet', witty friend of **Romeo**.

**Mercy**, Sisters of. *See in Index* **Sisters of Mercy**

**Mercyhurst College**, at **Erie**, Pa.; Roman Catholic, for women, founded 1926; arts and sciences, commercial course, home economics.

**Mer'edith**, **George** (1828-1909), English novelist and poet, one of great masters of Victorian Age; 'The Egoist', his masterpiece, analytical and subtle; 'The Ordeal of Richard Feverel', easier reading, containing some of his most beautiful passages; 'Diana of the Crossways', his greatest popular success; 'Adventures of Harry Richmond', a romantic novel: E-287, N-182  
 quoted F-42

**Meredith**, **Owen**. *See in Index* **Lytton**, **Edward Robert**, **Earl of**

**Meredith**, **Sir William Ralph** (1840-1923), Canadian statesman and jurist; did notable work as legislator, particularly on workingmen's laws; served as senator, chief justice of Ontario, chancellor of University of Toronto.

**Meredith College**, at **Raleigh**, N.C.; Baptist institution for women, founded 1891; arts and sciences, music.

**Meres** (*mērēz*), **Francis** (1565-1647), English author and clergyman, born Lincolnshire; 1598 published 'Paladis Tania: Wit's Treasury', a review of literary work from Chaucer to his own day  
 praises Shakespeare S-96

**Merzhkovsky** (*mēr-ēsh-kōf'skē*), **Dmitri Sergeievich** (1865-1941),

Russian author of historical novels; 'Romance of Leonardo da Vinci', one of a trilogy titled 'Christ and Antichrist', dealing with struggle between Christianity and paganism.

**Merganser** (*mēr-gān'sēr*), sawbill, or sheldrake, a duck D-118  
 foot, picture B-129

**Mergenthaler** (*mēr'gēn-tā-lēr*), **Ottmar** (1854-99), German-American inventor of linotype L-149

**Merida** (*mā-rē-dā*), **Carlos** (born 1893), artist, born Guatemala; removed to **Mexico** 1919 and became identified with Mexican modern art movement; called "representative of Mexican abstract painting".

**Merida** (*mā-rē-thā*) (ancient **Augusta Emerita**), a town in s.w. Spain, important in Roman times and under Moors; ruins include a stone-arched bridge crossing the **Guadiana**, a wall, triumphal arch, amphitheater, and circus.

**Merida**, capital of **Yucatan**, **Mexico**, 23 mi. s. of its port, **Progreso**, on **Gulf of Mexico**; pop. 120,000; center for manufacture and export of henequen: map M-133

**Merida**, **Cordillera de**, branch of **Andes** Mts. in w. **Venezuela** V-275, maps V-276, S-208b

**Mer'idēn**, Conn., city 18 mi. n. of **New Haven**; pop. 39,494; noted for silver-plated ware; also manufactures electric fixtures, hardware, automobile accessories, decorated glass: map C-336

**Merid'ian**, Miss., 2d city of state, 90 mi. e. of **Jackson** in agricultural and lumbering region; pop. 35,481; cotton products, lumber; railroad shops: map M-200

**Meridian**, an imaginary n. and s. line on earth's surface, passing through the poles L-70  
 map-making M-58, 59

**Meridian**, in astronomy, the vertical circle which passes through the poles of the celestial sphere and the zenith of any given place on the earth's surface.

**Mérimée** (*mā-rē-mā'*), **Prosper** (1803-70), French novelist, historian and critic, great master of style ('Chronique du regne de Charles IX'; 'Carmen'; 'Colomba'; 'Mateo Falcone'; 'Lettres à une inconnue'): F-197

**Merino**, a breed of sheep S-105-6, A-53, picture S-105  
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**Merit**, Legion of, U. S. D-32

**Merit**, Medal for, U. S. D-32

**Merit**, Order for, Germany D-32

**Merit**, Order of, England D-35

**Meriwether Lewis National Monument**, Tenn. N-22b

**Merlin**, legendary bard, magician, and counselor of Arthurian romance; born of a human mother and a spirit father, from whom he inherited his supernatural abilities; aided kings of Britain, especially **Arthur**, by means of his magic art; through the treachery of **Viviane**, the Lady of the Lake, to whom he taught his magic, he disappeared and lived in an enchanted tower in the forest of **Brécéliande**: A-315, R-159

**Mer'maid** M-120

**Mermaids' purses** S-154

**Mermaid Tavern**, famous old London tavern J-227, S-96

**Mer'man** M-120

**Merope** (*mēr'ō-pē*), daughter of **Atlas** and wife of **Sisyphus** of **Corinth**; she is represented as the seventh and least visible of the stars of the **Pleiades** because she was ashamed of having married a mortal.

**Merovingians** (*mēr-ō-vin'jī-ānz*), Frankish royal line, founded by **Clovis** (ruled 496-752 A.D.) F-180  
**Merriam**, **Clinton Hart** (1855-1942), American naturalist, born New York City; chief of U.S. Biological Survey 1885-1910; author of books on natural history, Indians and Indian legends.

**Merriam**, **John Campbell** (born 1869), American paleontologist, born Hopkinton, Iowa; professor University of California; president Carnegie Institution, Washington, D. C. 1920-38 ('The Living Past').

**Mer'rick**, **Leonard** (1864-1939), English writer, best known for novels and short stories; also wrote plays; has charm, humor, and keen observation ('Conrad in Quest of His Youth'; 'Cynthia'; 'The Actor-Manager'; 'The Man Who Understood Women'; 'The Little Dog Laughed').

**Merrilies** (*mēr'i-lēz*), **Meg**, a gipsy woman in Scott's 'Guy Mannerling' who helped young **Harry Bertram**, kidnapped in childhood, to regain his rightful property.

**Mer'rimac**, Confederate ironclad warship in Civil War M-224-5

**Merrimack River**, rises in White Mountains of New Hampshire and flows s. through Massachusetts into Atlantic at Newburyport: maps N-86, M-82

water-power N-86; **Lawrence** L-75-6; **Lowell** L-210

**Mer'ritt**, **Wesley** (1836-1910), American soldier, graduated from West Point 1860, distinguished himself as cavalry commander in Shenandoah valley and in Richmond campaigns, and rose to rank of major general of volunteers; May 1898 commanded U.S. troops in Philippines and was first military governor of the islands; retired 1900.

**Merritt**, **William Hamilton** (1793-1862), Canadian statesman, born Bedford, N. Y.; founded St. Catharines, Ont., and promoted building of Welland Ship Canal; president of Executive Council of Canada 1848-50.

**Merritt**, **Lake**, Calif., situated in the center of Oakland, and connected by narrow inlet with San Francisco Bay; a popular resort.

**Merry del Val** (*mēr'ē dēl vāl*), **Raphael** (1865-1930), Cardinal, Roman Catholic prelate, born in London, England, of Spanish parentage; papal secretary of state under **Pius X** ('The Truth of the Papal Claims').

**Merryman case** T-8

**Merry Mount**, settlement made by **Thomas Morton** and others within present Quincy, Mass. (1625); dispersed by disapproving Plymouth Puritans.

'**Merry Wives of Windsor**', rollicking farce by Shakespeare, written about 1600; Falstaff makes love to merry wives, Mrs. Ford and Mrs. Page, who make a dupe of him; secondary love plot that of Anne Page and Fenton  
 chronology and rank S-100e

**Mer'sen**, Treaty of, **Charles the Bald** of France and **Louis of Germany** divided Lotharinga, the territory left by their nephew **Lothair II** (870).

**Mer'sey**, river in n.w. England; flows 70 mi. w. to Irish Sea; wide estuary forms **Liverpool harbor**: L-165, 166

**Manchester ship canal** H-216, E-278

Key—cāpe, āt, fūr, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŷde, fūll, būrn;



Merten'sia, a genus of smooth or soft-hairy perennial herbs of the borage family with veiny pale-green leaves and loose clusters of attractive purplish-blue flowers; a common species is the Virginia cowslip (*Mertensia virginica*).

Merthyr Tydfil (*mēr'thēr tid'vil*), city in S. Wales on River Taff 22 mi. n.w. of Cardiff; pop. 71,000; chief seat of Welsh iron industry: map E-270a

Merton College, Oxford O-260

Merv (*mēr'*), oasis and ancient city in Russian Turkestan, 120 mi. n. of Afghanistan frontier A-328

Méryon (*mā-rē-yōn'*), Charles (1821-68), French etcher; best known for his etchings of Paris: E-295-6

Mesa (*mā'sā*), Ariz., town 15 mi. s.e. of Phoenix; pop. 7224; founded 1878 by Mormons; power and water from Roosevelt Dam; cotton gins, fruit packing; Mormon temple.

Mesa, tableland of s.w. U.S. C-314, P-201, picture I-55  
Arizona A-288  
New Mexico N-94, 96  
site of pueblos P-365

Mesa'bi Range, Minn., famous iron-mining region I-135, map M-192  
open pit mine, picture I-134

Mesa Verde (*mā'sā vēr'dā*) (Spanish "green table"), national park in s.w. Colorado; 77 sq. mi.; ruins of prehistoric cliff dwellings: C-314, N-22b, pictures C-269, 270

Mescaleros, tribe of Apache Indians in New Mexico N-99

Mesdag (*mēs'dāg*), Hendrik Willem (1831-1915), Dutch marine painter, distinguished for studies of North Sea ('Return of the Fishing Boats'; 'After the Storm'); gave collection of modern paintings to The Hague.

Mesembryanthemum (*mēs-ēm-brī-ān'-thē-mūm*). See Fig marigold

Meshed (*mēsh'ed*) ("place of martyrdom"), Persia, oasis town, capital of province of Khorasan in n.e.; pop. 140,000; fine silks, carpets, sword blades; shrine of Imam Riza, famous Shiite leader of 9th century; visited by many Mohammedan pilgrims: map A-332b

Mesmer, Friedrich Anton (1733-1815), Austrian physician; originator of theory of "animal magnetism" or "mesmerism" H-378

Mesmerism H-378

Mesocephalic, in ethnology "medium-headed" R-10

Meship'pus, extinct horse-like animal, picture H-340

Mesolithic Age, Middle Stone Age M-47, 48

Mesolongion, Greece. See Missolonghi

Mesophytes, plants adapted to moderate conditions of dryness; intermediate between hydrophytes and xerophytes.

Mesopotamia, region in Asia between Tigris and Euphrates rivers (now included in new kingdom of Iraq): M-120-1, maps A-242, A-332b. See also Iraq

ancient civilization, Outline A-192-3.

See also Babylonia and Assyria

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Kish K-25, M-120; excavations K-25, pictures A-258, K-25, T-121

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oldest wheeled vehicle T-121

pottery P-330

shelter S-111

Arab rule M-121, B-14

Baghdad B-14-15

brickmaking, picture B-236

contributions to civilization C-246

Mongol conquest M-223

Tigris and Euphrates rivers T-93, E-315

World War, first W-160

Mesopotamia, Argentine A-280, 280a

Mesothorium, a radio-active substance midway between radio-thorium and thorium, resulting from the disintegration of thorium; used to make luminous paint, especially for clock dials.

Mesotron, a particle of matter A-362

Mesozoic era, in geology G-40, 42

plant and animal life A-204-10

Mesquite (*mēs-kēt'*), also called honey locust, a shrub M-121

Messenger (*mēs-sā-zhā'*), André (1853-1929), French musician; director opera in Paris and London.

'Message to Garcia'. See García y Iñiguez; Rowan, Andrew S.

Messalina (*mēs-dā-lī'nā*), Valeria (died 48 A.D.), profligate 3d wife of Roman emperor Claudius.

'Messenger,' an English thoroughbred stallion imported to America in 1788; chief founder of the standard bred trotting horse: H-344

Messe'nia, county of ancient Greece in s.w. Peloponnesus; cap. Messene: maps G-154

Sparta conquers G-156

Messiah ('the Anointed'), in early Biblical history, one who had been anointed with holy oils and dedicated to some high service; name later used by Jews to signify the promised savior of the world; applied by Christians to Jesus; same as Greek word Christ.

'Messiah', oratorio by George Frederick Handel H-209

Messina (*mēs-sē'nā*), seaport in n.e. Sicily on Strait of Messina between Italy and Sicily; pop. 195,000: S-139-40, map I-156

earthquake destroys (1908) S-140

Messina, Strait of, between Italy and Sicily, map I-156

mirages M-199

Scylla and Charybdis myth O-205

Mestizos (*mēs-tēs'sōs*), persons of mixed blood in Spanish-American countries S-205b, c, L-67e

Argentina A-800b

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Central America C-133, 133a

Chile C-207, 207d

Ecuador E-155, picture L-67f

Mexico M-135-6

Peru P-140

Philippines P-166

Santo Domingo S-28

Venezuela V-276

Mestre (*mēs'trā*), Italy, city 5 mi. n. of Venice; pop. 30,000: V-279

Mestrovic (*mēs'trō-vich*), Ivan (born 1883), Yugoslav sculptor, son of Croatian peasants; art education in Vienna; first exhibition at 19; work shows strength, dramatic intensity, and excellent design (portraits of his mother and of President Masaryk; two gigantic equestrian statues of American Indians, in Grant Park, Chicago)

place in modern art S-62

wood-carving W-136-8

Metabolism, term for chemical changes taking place in living cell of plant or animal body, including anabolism, building up of more complex substances from simpler ones, and katabolism, breaking down of complex substances: B-110, pictograph H-258a

basal metabolism B-118-19, R-80

Metacarpal bone, any one of several bones between the wrist and the fingers S-156, picture S-156

Metacenter, in ship building, picture S-124

Metacom, or Metacomet. See in Index Philip, King

Metal, Age of M-49

Metal furniture F-222

Metallic paints P-32

Metallic soaps P-32a

Metalloids A-130

Metallurgy (*mēt'd-lūr-jī*), science of extracting metal from ore and refining M-122-3. See also in Index Alloys; and the principal metals by name

aluminum solvent discovered A-138, H-201, picture A-138

assaying A-338

crystalline structure of metals A-133, C-409

electric furnace F-218-19

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thermit reduction A-139

X-ray spectroscopy A-133

"Metal Mike," automatic steering device G-192, A-385

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expansion under heat; antimony contracts on solidifying A-132; invar practically unchangeable N-143; platinum same as glass P-246; thermometers employ T-79

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- 'Metamorphoses'** (*mēt-ā-mōr'fō-sēz*), poems by Ovid L-69
- Metamorphosis** (Greek, "change of form"), in zoölogy, transformation of structure during growth. *See also in Index* Larva; Pupa  
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 "sub-imago" stage in May-flies M-94  
 toad tadpole T-101
- Metaphor**, figure of speech F-32
- Metaphysics**, branch of philosophy P-172
- Meta** (*mā'tā*) River, Colombia, rises s. of Bogotá and flows into Orinoco River in n.e. Colombia; 600 mi. long: map C-305
- Metastasio**, Pietro Bonaventura Trupassi (1698-1782), Italian poet and dramatist, court poet at Vienna for 50 years; composer of many lyric dramas.
- Metatarsal bone**, any of several bones between the ankle and the toes S-156, picture S-156
- Metatarsus**, instep F-146, S-156
- Metate** (*mā-tā'tā*), stone for grinding grain, picture M-136
- Metathesis**, double decomposition of chemical compounds C-171
- Metaurus** (*mā-tā'q-rs*), small river in central Italy, emptying into Adriatic Sea; scene of defeat and death of Hasdrubal when on his way to aid his brother Hannibal (in second Punic War 207 B.C.).
- Metaxas** (*mēt-āks-ās*'), John (1871-1941), Greek political leader; born on island of Ithaca; chief of staff of army, 1915; exiled to Corsica for German sympathies when Greece joined Allies in 1st World War; led unsuccessful revolt against Venizelos in 1923; with support of King and army set up dictatorship in August, 1936: G-163
- Metazoa**, animal group including all many-celled types A-199
- Metcalf**, Willard Leroy (1858-1925), American landscape painter, born Lowell, Mass.; painted outdoor light in all its varied gradations; quiet colors of exquisite tone.
- Metcalf**, Charles Theophilus, Baron (1785-1846), British statesman, born India; after holding various positions of state in India, became provisional governor general 1835; granted freedom to Indian press; governor Jamaica, 1839-42; governor general Canada 1843-45.
- Metchnikoff** (*mēch'nē-kōff*), or **Mech-nikoff**, Elie (1845-1916), Russian bacteriologist, naturalized in France; originated theory of phagocytosis, that inflammation is due to struggle between white corpuscles and disease germs in the blood; held that a diet of sour milk would lengthen human life by checking intestinal bacteria; 1908 Nobel prize winner in medicine.
- Metempsychosis** (*mē-tēmp-si-kō'sis*), transmigration of the soul H-293, B-259, P-374
- Meteora**, monastery in Thessaly G-164
- Meteor Crater** (Winslow Meteor, Meteor Mountain), Ariz., huge pit 570 ft. deep whose rim rises on an average of 120 ft. above the plain, believed to have been formed by a meteor; 22 mi. w. of Winslow; 10 mi. s. of Canyon Diabole station on Santa Fe Railroad: M-126, picture M-127
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- Me'ter**, fundamental unit of length in metric system (39.37 in.) M-130  
 standard, picture W-66: measured in terms of light wave-length M-149
- Meter**, for gas, electricity, and water M-128-30  
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- Meter**, in poetry P-269
- Methane**, or marsh gas, an odorless hydrocarbon (CH<sub>4</sub>), which forms a methyl radical in chemical combinations. *See also in Index* Fire-damp; Paraffin series  
 chemical formula C-176b  
 illuminating gas contains G-22, 24  
 wood pulp liquor yields C-343
- Methanol**. *See in Index* Methyl alcohol
- Meth'odism**, a religious movement whose various bodies have a world membership of about 12,000,000  
 Canada, unites with other denominations C-234  
 founded by Wesley W-71-2  
 origin of name W-72  
 United States C-233  
 Wales W-3
- Methodist Church**, a Protestant organization formed by the union, in 1939, of the Methodist Episcopal Church (organized in the U. S. in 1784), the Methodist Episcopal Church, South (organized in 1845), and the Methodist Protestant Church (organized in 1828); 7,000,000 members in the U. S.
- Metho'dius**, Saint (826?-885), Greek missionary with his brother, Saint Cyril, to the Slavs; archbishop of Moravia and Pannonia; festival July 5.
- Methu'en**, Mass., residential city 26 mi. n. of Boston on Spicket and Merrimack rivers; pop. 21,880; cotton and woolen goods, yarns, bells.
- Methuen Treaty** (1703) P-314
- Methuselah** (*mē-thū'sē-lā*), son of Enoch and father of Lamech; Genesis v, 27 assigns him a lifetime of 969 years.
- Methyl**, a chemical radical (CH<sub>3</sub>) derived from ethane, existing in combinations.
- Methyl alcohol**, also called wood alcohol and methanol A-112  
 solvent for lacquer L-52  
 synthetic: from coal gas H-368; from corn C-368
- Methyl chloride**, a compound of methyl and chlorine (CH<sub>3</sub>Cl)  
 refrigerant R-70
- Met'ic**, a freed slave in Athens G-158
- Métis** (*mā-tē*'), French-Canadian half-breeds  
 Red River Rebellion M-54
- Metlakat'la**, village in s.e. Alaska, 15 mi. s. of Ketchikan; cooperative Indian village, pop. about 500; U.S. Army and Navy base: map A-105
- Metonymy**, in rhetoric, figure of speech in which one word is used for another to which it bears some close relation, as "the kettle boils," instead of "the water boils." Synecdoche is a form of metonymy.
- Metopes** (*mēt'ō-pēz*), in architecture, picture A-259  
 Parthenon A-11
- Met'ric system** of weights and measures M-130, W-69, table W-68
- Met'ric ton** (French *millier*), unit in metric system (2204.6 lbs.) M-130
- Metronome**, time-beating device S-198, picture M-322
- Metropol'itan**, an ecclesiastical title in the Christian church, almost equivalent to archbishop; holder has oversight over bishops of subordinate sees; title arose from old custom of giving precedence to bishop of metropolis.
- Metropolitan Museum of Art**. New York City, picture N-126, table M-392

Key—cāpe, āt, fār, fāst, whqt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŭde, fŭll, būrn;

Rodin's statues R-126  
Washington's bust by Ceracchi, *picture* W-21  
Metsu (*mēt'sy*), Gabriel (1630-67), Dutch painter; noted for fair and market scenes and for truthful representation of life in both low and high classes of society ('The Music Lesson'; 'Amsterdam Market') 'The Order', *picture* E-334  
Metternich (*mēt'ēr-nīk*), Clemens, Prince (1773-1859), Austrian reactionary statesman and diplomat; influence over Congress of Vienna (1814-15) secured preponderance of Austria in European affairs; period of 1815-48 is sometimes called "Age of Metternich"  
Alexander I influenced by A-113  
Congress of Vienna V-298  
"Grand Alliance" E-324  
quoted on Italy I-157  
Mettur-Cauvery Dam, India, on Cauvery River in province of Madras; irrigates 1,300,000 acres: *table* D-357  
Metz (*mêts*, French *mês*), city of Lorraine; pop. 83,000: M-130-1  
Meulles, Chevalier Jacques de (flourished 1682-86), French statesman, born Poitou; intendant of New France 1682-86.  
Meunier (*mūn-yā*), Constantin (1831-1905), Belgian sculptor; portrayed men or women at work ('The Hammerman', 'The Sower', 'Monument to Labor'): S-62  
Meurthe-et-Moselle (*mūrt-ā-mō-zēl'*), department of Alsace-Lorraine; area, 2038 sq. mi.: A-137  
Meuse (*mūz*), department of Alsace-Lorraine; area, 2409 sq. mi.: A-137  
Meuse, important river of w. Europe; 560 mi. long; in Holland called Maas: M-131, *maps* B-87, W-166-7  
commerce M-131: Rotterdam R-159  
delta N-66, *map* B-87  
Meuse-Argonne (*ān-gōn'*), region in France between Verdun and Vouziers extending from Meuse River 25 mi. w. to Aisne River  
1st World War A-282, *map* W-158  
2d World War A-282  
Mexican/II, city in Lower California; pop. 15,000: C-35  
Mexican bean, or frijole B-65  
Mexican bean beetle. *See in Index*  
Bean beetle, Mexican  
Mexican cigar-flower. *See in Index*  
Cuphea  
Mexican grass, a fiber obtained from several species of Mexican agaves; used in brush manufacture.  
Mexican grebe (*colymbus dominicus brachypterus*), a member of the grebe family; range s. Lower California and s. Texas s. to Panama.  
Mexican jumping bean. *See in Index*  
Jumping bean  
Mexican lace, *picture* L-49  
Mexican mahogany M-37  
Mexican rubber tree. *See in Index*  
Caucho  
Mexican shell flower. *See in Index*  
Tigridia  
Mexican sunflower. *See in Index*  
Tithonia  
Mexican swordtail, a fish, *color plate* A-233a-b  
Mexican tulip-poppy. *See in Index*  
Hunnemannia  
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Mexico, a republic of North America; 767,198 sq. mi.; pop. 19,500,000; cap. Mexico City: M-132a-43, *maps* M-133, N-150a, c, *Outline* M-143. *See also in Index* Central America; Latin America  
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United States relations M-140, 141-2, 142e, f, L-67o  
vegetation, *map* N-150a  
Yucatan peninsula Y-210-11  
Mexico, state in s. cent. Mexico; 8267 sq. mi.; pop. 990,000; cap. Toluca (pop. 41,000).  
Mexico, D. F., official name of Mexico City; "D. F." stands for *Distrito Federal*, referring to federal district in which city is located.  
Mexico, Gulf of, arm of the Atlantic, almost enclosed by U. S., Mexico, and Cuba: G-184, *maps* N-150a, c. *See also in Index* Ocean, *table* canals C-69  
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Mexico City, capital of Mexico; pop. over 1,000,000: M-144-5, *map* M-133  
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National University M-142b  
origin, legend of F-96  
Palace of Fine Arts, *picture* M-142b  
penitentiary, *picture* P-349  
Meyer, Adolf (born 1866), American psychiatrist, born in Switzerland; came to U. S. in 1892  
mental hygiene movement M-118  
Meyer (*mī'ēr*), Conrad Ferdinand (1825-98), Swiss poet and historical novelist; clear, polished style ('Jürg Jenatsch'; 'Thomas à Becket, the Saint').  
Meyer, George von Lengerke (1858-1918), statesman, born Boston; ambassador to Italy 1900-05, to Russia 1905-07; postmaster general under President T. Roosevelt; secretary of navy under President Taft.  
Meyerbeer (*mī'ēr-bār*), Giacomo (1791-1864), German composer of operas; first followed Italian, then French style; a master of dramatic effects ('The Prophet'; 'Dinorah'; 'L'Africaine')  
'The Huguenots' O-230: historical background H-354  
Meyerhold, V. E. (born 1873), Russian actor and stage director D-97  
Meynell (*mēn'ēl*), Alice (1849-1922), English poet and essayist; brought up in Italy; won praise of Ruskin, George Eliot, and Rossetti; rigid restraint, perfection of craftsmanship ('Preludes', 'Renouncement', 'A Father of Women', 'The Rhythm of Life'); daughter Viola Meynell also an able poet and novelist.  
Mezereum (*mē-zē'rē-ūm*) family, or Thymelaeaceae (*thīm-ē-lē-ā'sē-ē*), a family of plants, shrubs, and trees including the spurge flax, leatherwood, rice flower, and the gnidias.  
Mézières (*māz-yēr'*), town in n. France, 125 mi. n.e. of Paris; pop. 11,000; resisted Allies for six weeks after Waterloo 1815; taken by Germans 1871, 1914, and 1940.  
Mézy, Augustin de Saffray, Chevalier de (died 1665), French politician, appointed governor of New France in 1663 through influence of Bishop Laval-Montmorency, but later rebelled against the policies of his patron.  
Mezzo (*mēd'zō*), in music, literally half or medium; often used with

ü=French u, German ü; gem. jō; thin. then; ã=French nasal (Jeañ); zh=French j (z in azure); k=German guttural ch



other words, as *mezzo forte*, moderately loud.

Mezzo-rilievo (*mēd'zō rēl-yā'vō*), or middle relief, in sculpture S-52, pictures S-53

Mez'zotint, method of engraving E-296

Mfumbiro (*'m-fgm'bē-rō*) system, or Kirunga system, chain of volcanic mountains in Africa A-38

Miami (*mī-ām'i*), Ariz., copper-mining town and cattle market in Pinal Mts. 7 mi. from Globe; pop. 4722.

Miami, Fla., in s.e. on Biscayne Bay: pop. 172,172; terminus of Dixie Highway; famous winter resort; shipping point for fruit and vegetables: M-145, maps F-111, 112

airport M-145

Intracoastal Waterway reaches C-69, F-114

Miami, Okla., city in n.e.; pop. 8345; lead and zinc mining, farming and live stock interests: map O-216

Miami and Erie Canal, name given in 1849 to the three canals previously known as the Miami Canal, the Miami Extension Canal, and the Wabash and Erie Canal; these canals gave Ohio a water route from Cincinnati to Toledo.

Miami Beach, Fla., island city off s.e. coast; pop. 28,012; popular winter resort: M-145, map F-112

Miami Indians, Algonquian tribe, first living in s.e. Wisconsin, then in s. Michigan, n.e. Illinois, n. Indiana, and Ohio

cede lands to U.S. T-28

Miami River, also called Great Miami River, rises in w. center of Ohio, flows s. to Ohio River; 160 mi. long: map O-210

Dayton flood D-22

Miami University, state institution at Oxford, Ohio; founded 1809; liberal arts and normal colleges; schools of business and fine arts

honors courses U-259

Miantonomo (*mī-ān-tō-nō'mō*) (1565?-1643), Narragansett Indian chief; condemned to death by whites for waging war against Uncas in spite of a treaty; killed by brother of Uncas; monument near Norwich, Conn.

Miaskovsky (*mē-yās-kōf'skē*), Nicola Yakovlevitch (born 1881), Russian composer, born Novogeorgievski; pupil of Rimsky-Korsakof; professor composition, Moscow Conservatory; best known for symphonies and symphonic poems, generally melancholy in tone; also wrote string quartets, piano music, and songs.

Mica, any of several transparent silicate minerals which split into sheets M-145, M-184

cleavage M-181

electric insulating properties E-221, 222; condensers use E-230

granite contains G-131

Micah (*mī'kā*) (about 757-700 B.C.), one of Hebrew minor prophets, contemporary of Isaiah; author of 33d book of Old Testament.

Micarta, a synthetic plastic P-246

Mica schist, a metamorphic rock composed chiefly of mica and quartz; divides readily into slabs.

Micaw'ber, Wilkins, in Dickens' 'David Copperfield', an impractical optimist who is always waiting for "something to turn up": D-65

Mice. See in Index Mouse

Michael (*mī'kēl*), archangel, leader of celestial armies (Rev. xii, 7); commemorated as saint September 29.

Michael V, or Mihai (*mē-hī'*) (born

1921), king of Rumania; in 1927 succeeded his grandfather, Ferdinand I, as King Michael I, his father, Carol, having given up rights to throne; government in hands of regency during Michael's reign which lasted until his father's return to throne in 1930; again became king 1940 when his father abdicated.

Michael Angelo Titmarsh, pen name of William Makepeace Thackeray T-72

Michaelmas, the feast of St. Michael, September 29.

Michaelmas daisy, or Christmas daisy, a species of aster A-339

Michael Obrenovitch (*ō-brēn'ō-vich*) III (1823-68), prince of Serbia; succeeded 1840, deposed 1842, restored 1860; secured withdrawal of Turkish troops from Serbia; assassinated by Karageorgevitch supporters.

Michel Accault. See in Index Aco, or Accault, Michel

Michel (*mē-shēl'*), Claude, called Clodion (1738-1814), French sculptor, favored by Louis XV for whom he did portrait statues; noted for graceful nymphs, fauns, and bacchantes.

Michelangelo (*mī-kēl-ān'jē-lō*, Italian *mē-kēl-ān'jā-lō*), Buonarroti (1475-1564), Italian sculptor, painter, architect, and poet M-146-8, S-58

'Creation of Adam', painting, picture M-147

'David', statue M-148, I-170

'Dawn and Dusk', sculpture, picture M-147

dome of St. Peter's church M-148

drawing, picture D-101

'Dying Slave', statue, picture M-147

fresco painting, method P-15

'Holy Family', painting, picture M-147

'Last Judgment', fresco M-148

'Lorenzo de' Medici', statue, picture M-107

'Madonna della Pietà', picture M-148

method of work S-65

'Moses', statue, picture M-146

Palace of Senators, façade, picture R-139

Sibyls in Sistine Chapel S-139

Michelet (*mēsh-lē'*), Jules (1798-1874), French historian, learned and interesting, but partisan and uncritical ('Histoire de France').

Michelson, Albert A. (1852-1931), American physicist M-149

echelon spectroscopy S-242

ether drift experiment M-149, R-15

interferometer L-129; light speed measured by L-127-8, M-149

star diameters measured S-276

Michigan (*mish'i-gān*), a n. cent. state of U.S.; 58,216 sq. mi.; pop. 5,256,106; cap. Lansing: M-150-5, maps M-153, U-188c

agriculture M-152, picture M-151; beans B-65; fruit-growing M-152, picture M-150; grapes G-136

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first agricultural college E-182

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flower, state S-279

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Detroit capital of Michigan Territory D-57

Ohio boundary dispute O-214

part of Northwest Territory N-171

Isle Royale National Park N-22a

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nickname, origin of W-130

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Upper Peninsula M-153

Michigan, Lake, third largest of Great Lakes (22,400 sq. mi.) M-155, G-146-50a, maps G-146a, 147, U-188c

Chicago Drainage Canal C-69, M-155; water diversion problem G-150, C-189

fisheries G-150, W-125

height and depth, diagram G-146a

sand dunes S-22, picture I-47

tide T-92

Michigan, University of, at Ann Arbor, Mich.; state control; chartered 1817, opened 1841; arts and science, engineering and architecture, medicine and surgery, law, pharmacy, dentistry, education, business administration, forestry and conservation; graduate school: E-181, picture M-154b

football history F-151c

telescope O-194

women first admitted E-181

Michigan Avenue, Chicago, picture C-187

Michigan City, Ind., manufacturing city and port at s. end of Lake Michigan 40 mi. e. of Chicago; pop. 26,476; trade in lumber, sand, and iron ore; railroad cars, furniture, iron products, brick, machinery: map I-46

Michigan College of Mining and Technology, at Houghton, Mich.; men; state institution; founded 1885, opened 1886; chemical, civil, electrical, general, mechanical, metallurgical, and mining engineering, and chemistry and geology.

Michigan grayling, a fish T-145

Michigan Road R-116

Michigan State College of Agriculture and Applied Science, at East Lansing, Mich.; chartered 1855, opened 1857, as Michigan Agricultural College; agriculture, engineering, home economics, forestry, veterinary medicine; first institution for agricultural education in U. S.

Michilimackinac (*mīk-i-lī-māk'i-nā*), mission station established at St. Ignace, Mich., by Marquette M-154

Michoacán (*mē-chō-ā-kān'*), state in s. Mexico on Pacific; 23,200 sq. mi.; pop. 1,050,000; cap. Morelia.

Mickey Mouse, animated cartoon character, created (1928) by Walt Disney; in France "Michel Souris," in Japan "Miki Kuchi," in Spain "Miguel Ratoncoto," in Denmark "Mikkell Mus."

Mickiewicz (*mēts-kē-yē'vēch*), Adam (1798-1855), greatest of Polish poets; chiefly famous for epics based on the folk tales and legends of his nation ('Pan Tadeusz'; 'Dziady'; 'Grazyna'); buried in cathedral at Cracow.

Micmac (*mīk'māk*), from Indian word *migmak*, allies, important Algonquian Indian tribe of Nova Scotia and neighboring parts of Canada; became fast friends of

Key—cāpe. āt, fār. fāst. whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŭde, fŭll, bŭrn;

French and were only slowly won to friendship with British; their government was similar to that of New England Indians: I-53

**Microbes** (*mī'krōbz*), bacteria G-78. See also in *Index* Bacteria; Germ theory of disease

**Microchemistry**, a technique of chemical research in which very small amounts of material are used under minutely controlled conditions; special equipment is required.

**Microcline**, a feldspar with triclinic crystals, having three unequal, inclined axes.

**Microfarad** (*mī'krō-fār-ād*), in electricity E-230

**Microfilm**, photographic film similar to motion picture film on which record copies of the pages of books, newspapers, and manuscripts are made: P-186, L-106j, 106, *pictures* L-106p newspapers N-109

**Microgroove process**, for phonograph records P-176

**Microm'eter**, an instrument for small measurements M-155, T-112 scale, how to read M-155

**Mi'cron**, a very small metric unit of length (.0001 centimeter) bacteria measured by B-13 micrometer measures M-155 ultramicroscope measures M-158

**Micronesia** (*mī-krō-nē'shī-ā*), a collection of small island groups in Pacific P-4, J-186, *map* P-10b

**Micro-organisms** G-77. See also in *Index* Bacteria; Protozoa; Unicellular organisms killed by heat in canning C-74-5 life cycles, part in, *pictographs* P-238a, b

**Microphone**, a device in which carbon granules packed behind a diaphragm transform sound waves into changes in electric current: example, telephone transmitter, *picture* T-35

detective dictograph D-68

Edison's invention, *picture* E-160

invented by Edison E-161

motion picture sound recording, *pictures* M-283, 275

radio R-20, 26, *pictures* R-29, 31b

submarine signaling for ships S-143

**Micropodidae** (*mī-krō-pō-dī-dī*), family of birds composed of swifts.

**Micropodiformes** (*mī-krō-pō-dī-fōr'mēz*), an order of tiny, insectivorous birds, comprising hummingbirds and swifts.

**Mi'roscope** M-156-8

binocular S-286

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electron microscope M-158, *picture* M-156b

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**Mi'das**, in Greek mythology M-158

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science advanced by Roger Bacon B-11

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homes in Germany, *pictures* G-72, G-110, N-185

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water supply W-54

weights and measures W-66-7

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**Middle America**, the part of Latin America between South America and the United States; includes Central America, West Indies, and Mexico.

**Middle Atlantic States**, name used by U. S. government for geographic division including states of New York, New Jersey, and Pennsylvania, and sometimes also Delaware and Maryland, *Outline* U-201

**Middlebury College**, at Middlebury, Vt.; founded 1800; classical, scientific, and pedagogical courses; Bread Loaf Writers' Conference held annually in August.

**Middle C**, in music S-197, M-318

**Middle Congo**, or Moven Congo, colony in s. French Equatorial Africa; about 175,000 sq. mi.; pop. 745,000; cap. Brazzaville: *map* A-42a

**Middle East**. See in *Index* Near East

**Middle English** E-282

**Middleman**, an agent between the producer and the retail seller

agricultural marketing A-56: cooperative societies eliminate C-355

'Middlemarch', novel by George Eliot; realistic study of a provincial English town and its people: E-252, 254

**Middle Park**, in cent. Colorado C-311

**Middle relief**, or mezzo-rilievo, in sculpture S-52, *pictures* S-53

**Middlesboro, Ky.**, summer resort and trading center just west of Cumberland Gap; pop. 11,777; coal mining, farming; live stock; leather, foundry products: *map* K-11

coal mine, *picture* K-13

**Middlesbrough** (*mid'le-brū*), seaport and manufacturing city on Tees River in n.e. England; pop. 138,000; iron and coal: *map* E-270a

**Middlesex**, England, small inland county forming n.w. part of Greater London; 232 sq. mi.; pop. 1,640,000; ancient county 283 sq. mi., of which about 50 sq. mi. are now included in administrative county of London.

**Middlesex Canal** of Massachusetts T-125

**Middle Stone Age**, or Mesolithic Age M-47, 48

**Middleton, Arthur** (1742-87), signer of Declaration of Independence; born South Carolina; wrote political articles under name "Andrew Marvel."

**Middleton, Sir Frederick Dobson** (1825-98), British soldier, born Belfast, Ireland; commander of Canadian militia 1884-90; in 1885 led expedition to Northwest Territories to suppress Riel rebellion.

**Middleton, Thomas** (1570?-1627), English dramatist; collaborated with William Rowley and others ('The Spanish Gypsy'; 'The Changeling'; 'A Fair Quarrel').

**Middletown, Conn.**, industrial and farming center on Connecticut River 15 mi. s. of Hartford; pop. 26,495; typewriters, textiles, marine engines, silverware: *map* C-336

Wesleyan University, *picture* C-337

**Middletown, N.Y.**, industrial and rail-

- road city, 50 mi. n.w. of New York City; pop. 21,908; in gardening, stock-raising, and dairying district; saw blades, lawn mowers, shirts, shoes; railroad shops; important in early days because of location between Hudson and Delaware rivers on old Minisink road: *map* N-114
- Middletown, Ohio, industrial and railroad city on Miami River 28 mi. n. of Cincinnati; pop. 31,220; paper, steel, tobacco: *map* O-210
- Middle Western States, in U. S., *Outline* U-203-4
- Middlings, in flour milling F-119
- Mid'ard, in Norse mythology, the Earth.
- Mid'gardsorm, or Midgard serpent, in Norse mythology O-202
- Thor and T-84
- Midge, small fly of the *Chironomidae* family; mosquito-like in form, but more delicate; abdomen long and slender; wings narrow; antennae usually plumelike; a few can bite, but greater number are harmless.
- Midget, a diminutive person, *picture* C-237c
- Midgley, Thomas, Jr. (born 1889), chemist, born Beaver Falls, Pa.; discovered tetra-ethyl lead (1922) as an anti-knock agent in gasoline; noted also for work on air-conditioning, rubber, and extraction of bromine from sea water.
- Mid-Hudson Bridge, in New York, *table* B-342
- Midhanites (*mid'i-än-its*), ancient Semitic people of North Arabia referred to in the Bible as merchants, warriors, and shepherds.
- Midiron, a golf club, *picture* G-118
- Midland, Mich., city on Tittabawassee River, 20 mi. n.w. of Saginaw; pop. 10,329; seat of Midland County; main plant of Dow Chemical Company
- magnesium M-33
- Midland, Ontario, Canada, town on Georgian Bay 80 mi. n. of Toronto; pop. 6920; grain elevators, lumber and flour mills, shipbuilding yards; government wireless station.
- Midland counties, a name applied collectively to most of the interior counties of England.
- Midlothian, or Edinburghshire, county of s.e. Scotland on Firth of Forth; 366 sq. mi.; pop. 525,000; oats chief crop; cap. Edinburgh.
- Midnight sun, *pictures* N-171, S-328
- Norway N-172, 176
- Sweden S-335
- Midshipman, in United States Navy, next below a commissioned officer, a student of the Naval Academy, N-44-5, *table* N-56c
- Midshipman, or singing-fish, a fish (*Porichthys notatus*), of the toad-fish family, common on the coast of California; has rows of phosphorescent shining spots like brass buttons; makes a peculiar humming noise with its air-bladder.
- Midsummer Day, Scandinavian holiday S-289, S-335
- 'Midsummer Night's Dream,' comedy by Shakespeare M-162, *pictures* M-162, D-94
- chronology and rank S-100e
- Mendelssohn's music to M-314
- 'Mid-Victorian' V-295
- Midway Islands, atolls belonging to U.S., n.w. of Hawaiian Islands; pop. 437; midway between Asia and America; discovered 1859 by Capt. N. C. Brooks, U.S. Navy; annexed 1867: *map* P-10c
- air base, *picture* P-10d
- cable C-9
- 2d World War battle W-178y
- U. S. naval base N-52, 53, *map* N-52
- Midwife toad T-101
- Miehle, Robert (1860-1932), American inventor, born Chicago
- Miehle printing press P-348
- Mieris (*mē'ris*), Frans van (the elder) (1635-81), Dutch genre painter, born Leyden; unusual skill in painting rich and colorful fabrics ('Two Ladies Drinking Tea'). His son, Willem van Mieris (1662-1747), was also a genre painter.
- Mies van der Rohe. *See in Index* Rohe, Mies van der, Ludwig
- Miffin, Thomas (1744-1800), American general and politician, born Philadelphia; colonel and first aide-de-camp to Washington; leader of unsuccessful 'Conway Cabal' to remove Washington; U.S. senator, governor of Pennsylvania.
- 'Mignon', opera by Ambroise Thomas, story O-232
- Mignonette (*min-yōn-ēt'*), a flowering plant M-162
- Mignonette, Jamaica. *See* Henna
- Mignonette-vine. *See* Madeira-vine
- Migration of animals M-163-6
- birds M-163-4, B-124. *See also in Index* Birds, subhead migration
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- earthworm E-137
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- Migration of peoples M-167-8. *See also in Index* Emigration; Immigration
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- Indians, Asia to America A-148-9
- Europeans to America M-168, I-22-4
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- Hittites H-312
- Indo-Europeans M-168, P-171: Aegean Islands A-27; Greece G-154-6; Italian peninsula R-128
- barbarians invade Roman Empire M-158-9, E-322-3: Goths G-123, A-99; Huns H-362; Lombards L-181; Vandals V-271
- Mongol invasions M-223-4, I-38
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- drought as a factor D-113b
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- Greeks and Moslems uprooted from Turkey and Greece G-162-3
- Jews to Palestine J-218
- 2d World War M-168, W-178u, *picture* W-178u
- Migratory agricultural workers L-44b
- Mihal (*mē-hi'*). *See in Index* Michael V
- Mihailovich (*mē'hī-lōv-ich*), Draja (born 1895), Yugoslavian general, born near Belgrade, Serbia; became hero of 2d World War when, after German occupation of Yugoslavia, he organized an army of more than 200,000 soldiers, including Chetniks and others, and regained thousands of square miles of territory; made minister of war and chief of staff by the Yugoslav government in exile (London) in 1942.
- Mikado (*mi-kā'dō*), the emperor of Japan J-191
- palace at Tokyo T-105
- 'Mikado', popular comic opera, book by Sir W. S. Gilbert, lively music by Sir Arthur S. Sullivan; first produced in London 1885; many revivals since.
- Miklas (*mēk'lās*), Wilhelm (born
- 1872), president of Austria 1928-38; began as high-school teacher; appointed head of schools; elected to parliament 1907; joined first National Assembly of the Republic 1918; became its chairman 1923.
- Milam, Ben (1791?-1835), Texan patriot, born Kentucky; led capture of San Antonio (1835) in Texas war for independence.
- Milan (*mē'lān*) Obrenovitch IV (1854-1901), prince of Serbia; succeeded 1868; secured Serbian independence and became king 1882; abdicated 1889 in favor of his son, Alexander I.
- Milan (*mī-lān'* or *mīl'ān*), Italy, Italian Milano (*mē-lā'nō*), 2d largest city of Italy; pop. 1,115,000: M-169, *map* I-156
- cathedral I-164-6, *pictures* I-163, E-329
- 'The Last Supper' V-300, *picture* V-299
- war of Charles V and Francis I F-186
- Milan, Edict of (313 A.D.) C-346
- Milanion (*mī-lān'i-on*), Greek youth who won Atalanta in foot race, *picture* A-351
- Milbank Memorial Fund, established 1905 by Elizabeth Milbank Anderson for advancement of health and social welfare P-162
- Milch (*mīlk*), Erhard (born 1892), German aviation officer; army pilot in 1st World War; chief of air force in 2d World War; made marshal in 1940.
- Mil'dews and molds M-169-70
- cheese C-164
- Mile, a unit of measure, *table* W-67
- nautical, *table* W-67: how measured L-179
- origin of name W-66
- Miles, Nelson A. (1839-1925), American soldier, born Westminster, Mass.; in Civil War rose from lieutenant to major general; fought at Antietam, Fredericksburg, Chancellorsville, the Wilderness, Spottsylvania, and Cold Harbor, and received Congressional Medal of Honor; later famous Indian fighter, captor of Apache chief Geronimo; after 1895 to his retirement 1903 senior officer commanding U.S. Army; lieutenant general by act of Congress (1900): *picture* S-219
- Miles City, Mont., trade center of Montana; horse, cattle, and wool district, 135 mi. n.e. of Billings on Yellowstone River; pop. 7313; railroad shops, stockyards, wool warehouses: *map* M-243
- end of the cattle trail C-112
- Millet, Pierre. *See in Index* Millet
- Miletus (*mī-lē'tūs*), great maritime city and republic on Aegean Sea in ancient Ionia, Asia Minor; colonizer and center of learning; stormed and sacked by Persians 494 B.C. for leading Ionian revolt: *map* A-25
- Milfoil, or yarrow, perennial herbs comprising the genus *Achillea* of the composite family with flower heads in flat-topped open clusters; among species cultivated as garden flowers are common yarrow or milfoil (*Achillea millefolium*) and fernleaf yarrow (*Achillea filipendulina*)
- how to plant G-10
- Milfoil, water. *See* Myriophyllum
- Milford, Conn., industrial town on Long Island Sound; pop. 16,439; at mouth of Wepowaug River, 10 mi. s.w. of New Haven; oyster cultivation, vegetable and field seed growing; metal manufactures.
- Milford, Mass., town on Charles River, 17 mi. s.e. of Worcester; pop. 15,-



388; textile machinery, shoes, hats, rubber goods; large granite quarries near by.

Milhaud (*mê-lô'*), Darius (born 1892), French composer of music in modern style; formerly member with Honegger of group of young French composers called "The Six."

Military Academy, U.S., West Point M-170-2, S-40

cadet's uniform M-170; origin U-180

commissioned officers A-307d-e

Military art and science. *See in Index* Army; United States Army; Warfare

Military aviation. *See in Index* Aviation, military and naval

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Military Cross, Belgian D-32

Military Cross, British D-32

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Military Medal, British D-32

Military parks, national, U.S. N-22f

Military service. *See in Index* Army; Conscription; United States Army

Military tactics. *See in Index* Tactics

Military training

ancient Greece E-168

knighthood K-29

United States, first World War W-169

Militia, in U.S., all able-bodied male citizens between 18 and 45, comprising National Guard, Naval Militia, Unorganized Militia

American Revolution R-86, 89

police duties P-238

powers of Congress over U-214

Militia, state, former name of National Guard A-307c. *See also in Index* National Guard

Millukov (*mê-lq-kôf'*), Pavel (Paul) N. (born 1859), Russian historian and statesman; leader of Constitutional Democrats in Revolution of 1917; fled to Paris when Bolsheviks gained control ('Russia, Today and Tomorrow').

Milk M-172-3. *See also in Index* Butter; Cheese; Dairying; Ice cream

Babcock test for butter-fat D-2

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buttermilk M-173

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pasteurized D-5, P-86

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secreted by glands G-99

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yield of D-2, C-104

Milking

by hand, picture A-56b

by machine, picture D-3

Milk of magnesia, emulsion of magnesium hydroxide in water M-33

Milk of sulphur S-324

Milk River, Mont., tributary of Missouri, 500 mi. long, map M-243

Milk sickness, also called "trembles" C-107

Milk snake, or house snake, a harmless common snake of North America about 4 ft. long or less; so named because of a misconception that it sucks milk from cows, although actually it seeks barns to feed on mice; strikingly colored with brownish blotches bordered with black; belongs to group of king snakes.

Milk sugar, or lactose, a double (disaccharide) sugar ( $C_{12}H_{22}O_{11}$ ) reducible to galactose and glucose; differs from maltose and sucrose in structure of molecule; about one-sixth as sweet as cane sugar: S-322

Milk teeth T-28, picture T-29

Milk thistle T-81

Milk tree, common name applied to several species of trees of genus *Sapium* and found in tropical regions; milky juice is a source of rubber.

Milkweed, perennial herb of the genus *Asclepias* M-173-4

directions for planting G-10

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Milkweed butterfly, or monarch butterfly, color plate N-3a-b

egg, picture E-193

food of larva M-174

Milky Way, the galaxy to which the earth belongs N-60, 61, S-273, charts S-275, 275d, pictures S-272, 275

number of stars in A-342

Mill, James (1773-1836), English philosopher and economist, whose strong personality and brilliant conversation added to influence of his books ('History of British India'; 'Analysis of the Human Mind', his greatest work); father of John Stuart Mill.

Mill, John Stuart (1806-73), English philosopher, economist, scholar, and enthusiastic democrat, son of James Mill, by whom he was educated; began Greek at 3, at 8 read Latin extensively; clerk in India House 33 years; exercised immense influence on contemporary thought; empiricist in philosophy, utilitarian in ethics, proprietor of *Westminster Review* 1837-40 ('Autobiography'; 'The Subjection of Women'; 'On Liberty'); books on logic and economics)

Carlyle C-84

Fabre, picture F-1

women's rights W-132

'Mill, The', by Sir Edward Burne-Jones, picture P-23

Mill

cement C-125-6

cotton C-378, pictures C-377, E-237:

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flour F-117-20. *See also in Index* Flour and flour-milling

rolling I-144, pictures I-140-1

sawmill L-218, pictures L-216, 217:

first in U.S. W-49

sugar S-320-2, pictures S-320, 321

Millais (*mîl-tā'*), Sir John Everett (1829-96), English painter M-174, P-23

Millay', Edna St. Vincent (Mrs. Eugene Jan Boissevain) (born 1892),

American poet M-174-5, A-182, picture A-183

"Mill-boy of the slashes," nickname applied to Henry Clay C-261

Milledge, John (1757-1818), American statesman and Revolutionary patriot; governor of Georgia 1802-6; United States senator 1806-9; in 1800 presented more than 600 acres of land to University of Georgia (chartered 1785); Milledgeville, Ga., named for him.

Milledgeville, Ga., town 30 mi. n.e. of Macon; pop. 6778; state cap. 1807-67; seized by General Sherman (1864); Georgia Military College, State College for Women; lumber, clay products

secession convention S-285

Millefleur (*mêl-flûr'*) style, in textile design T-65

Mille Lacs (*mêl lāk*), lake in central Minnesota, 16 mi. long, map M-192

exploration and early history M-194

Millennium, period of 1000 years, especially the 1000-year period preceding the Last Judgment, referred to in the Bible (Rev. xx, 1-5) as the kingdom of Christ on earth. Term also used for a 1000th anniversary, synonymous with millenary and millennial.

Millepore (*mîl'ê-pôr*), hydrozoan corals, color plate O-200c-d

Miller, Alice Duer (1874-1942), American writer of light fiction, born New York City ('The Charm School'; 'Gowns by Roberta'; 'White Cliffs', a short novel in verse).

Miller, Dayton Clarence (1866-1941), American physicist, born Strongsville, Ohio; professor Case School of Applied Science; important experiments in sound, ether theory, and light.

Miller, Elizabeth Cleveland (1889-1937), author of children's books, born Seymour, Conn. ('Children of the Mountain Eagle'; 'Fran of Albania'; 'Young Trajan').

Miller, Henry (John) (1860-1926), American actor, born London, England; early performances with Mme. Modjeska and Adelaide Neilson; later star in many plays, including 'Heartsease', 'The Only Way', and 'The Great Divide'.

Miller, Hugh (1802-56), Scottish geologist and man of letters; of great influence in establishment of free Scottish church; from work on Old Red Sandstone deposits decided that creation was perfected in six long periods.

Miller, Joaquin (1841-1913), pen name of Cincinnatus Heine Miller, American poet of the West; born in Indiana, taken as child to Oregon; was gold miner, soldier, journalist, lawyer, judge, and European traveler at various times; verses colorful and vigorous though not great poetry ('Songs of the Sierras'; 'Songs of the Sunlands'; 'The Danites in the Sierras', novel, later a play).

Miller, Kenneth Hayes (born 1876), painter and etcher, born Kenwood, N. Y.; instructor Art Student's League, New York City, 1911-36; sculptural quality in well-ordered compositions.

Miller, Lewis (1829-99), American inventor, manufacturer, and philanthropist, born Greentown, Ohio; active in Sunday school movement helps found Chautauqua C-163

Miller, Olive Thorne (Mrs. Harriet Mann) (1831-1918), American ornithological writer, born Auburn, N.Y.; took early interest in birds

- and wrote prolifically on bird life for young folks ('Children's Book of Birds'; 'Little Folks in Feather and Fur'; 'Little Brothers of the Air').
- Miller, William** (1782-1849), American religious leader, born Pittsfield, Mass.; captain in War of 1812; from study of Bible came to believe in second coming of Christ; founded Adventist movement in U. S. *See also in Index* Adventists
- Miller**, popular name for several kinds of moths, so called because the fine, dustlike scales on their wings and bodies reminded people of the men who work in flour mills.
- Miller, moth miller**, or owl-moth, moth of the cutworm C-418
- Millerand** (*mêl-rân*'), **Alexandre** (1859-1943), president of France 1920-24; minister of war in first years of 1st World War; senator after 1925; sponsored many social reforms; originally a Socialist, later a Liberal.
- Miller's-thumb**, a small swift fish (*Cottus*) which lurks wherever salmon or trout are found, preying upon the eggs and fry of its neighbors. It is the only representative of the great sculpin family in North American fresh waters.
- Milles** (*mîl'îs*), **Carl** (born 1875), Swedish sculptor, born near Upsala; early work influenced by Rodin; delicate and monumental subjects handled with equal skill; best known for finely designed, ruggedly modeled fountains ('Fountain of Diana'; 'Triton Fountain') fountain in St. Louis, Mo. S-10 monument, Wilmington, Del. W-105, *picture* D-40a statue in St. Paul, Minn. S-11
- Millesimo** (*mêl-lâ'zê-mô*), Italy, village 35 mi. w. of Genoa; Napoleon defeated Austrians 1796.
- Millet** (*mîl'êt*), **Francis David** (1846-1912), American artist and author, born Mattapoisett, Mass. ('Evolution of Navigation' in the Custom House, Baltimore, Md.); genre paintings ('A Cozy Corner'); wrote 'Capillary Crime and Other Stories'; 'The Danube'; 'The Expedition to the Philippines'; went down with the *Titanic*.
- Millet** (*mê-lâ'*), **Jean François** (1814-75), French painter of peasant life M-175-6 'Bringing Home the Newborn Calf', *picture* P-22
- Millet, or Millet, Pierre** (1635-1708), French-Canadian missionary who did notable work among Iroquois Indians in New York.
- Millet**, any of various cereal grasses with small grains borne on spikes or panicles M-176 India I-37
- Millet Cross**, Father, a national monument in New York N-22
- Mil'libar**, a unit used to measure barometric pressure B-50
- Mil'ligram**, unit in metric system (0.015 grain) M-130
- Millikan, Robert Andrews** (born 1868), American physicist, born Morrison, Ill.; department of physics University of Chicago 1896-1921; director Norman Bridge Laboratory of Physics, and chairman California Institute of Technology, Pasadena, Calif., since 1921; especially known for isolating electron and for researches on cosmic rays and on radiating properties of light atoms; won Nobel prize 1923: *picture* R-13 calculating electric charge of electron A-360
- cosmic rays R-15  
Pupin's influence P-368a
- Mil'liter**, unit in metric system (0.27 fluid drams) M-130
- Mil'limeter**, unit in metric system (0.03937 inch) M-130
- Millimicron**, one millionth of a millimeter S-242, *table* R-14
- Millin, Sarah Gertrude** (born 1889), British writer, born South Africa of Jewish parents; penetrating novels on South African life ('The Dark River'; 'God's Stepchildren'; 'An Artist in the Family'; 'The Coming of the Lord'; 'The Fiddler').
- Millinery**, women's hats; originally a general term for all feminine finery. The word is probably derived from Milaner, an inhabitant of Milan, Italy, a city once famous as a trade center for women's wear: H-235-6
- Milling**, of coins M-196
- Milling**, or fulling, of cloth W-145  
teasel plant used T-81-2, *picture* T-81
- Milling machines**, for working metal T-111, 112, *picture* T-110
- Milling of flour** F-117-20. *See also in Index* Flour and flour milling
- "Millions for defense, but not one cent for tribute" 'X Y Z' affair X-202
- Mil'lipede**, or "thousand legs," a many-legged arthropod C-131
- 'Mill on the Floss, The'**, novel by George Eliot, published 1860 N-182, E-252
- Mills, Enos A.** (1870-1922), American naturalist, born Kansas City, Kan.; author of articles urging protection of birds and wild flowers, and establishment of national parks ('Wild Life in the Rockies'; 'Rocky Mountain Wonderland') in Estes Park C-311
- Mills, Ogden Livingston** (1884-1937), American lawyer and secretary of the treasury, born Newport, R.I.; practised law in New York City and was active in New York State politics; member U.S. House of Representatives 1921-27; under-secretary of the treasury 1927-32; secretary of treasury 1932-33.
- Mills, Robert** (1781-1855), architect and engineer, born Charleston, S. C.; studied with Thomas Jefferson; as architect of public buildings, Washington, D. C., designed the Treasury, Patent Office and old Post Office; made original design for Washington Monument, Washington, D. C., but plans were greatly modified  
Washington memorial, Baltimore, *picture* B-33
- Mills, Roger Quarles** (1832-1911), American politician, born Todd County, Ky.; member of Congress from Texas 1873-92; as chairman of Ways and Means Committee introduced Mills Bill; U.S. senator 1892-99.
- Millsaps College**, at Jackson, Miss.; founded 1892 by Methodist Episcopal Church, South; arts and science.
- Mills Bill** C-266
- Mills College**, college of liberal and fine arts at Oakland, Calif.; for women; non-sectarian; founded in 1852 in Benicia, Calif.; first Protestant academy for girls on Pacific coast; removed to Oakland 1871; chartered as a college 1885.
- Millsapugh, Arthur Chester** (born 1883), American financial adviser to Persia and later to Haiti; born Augusta, Mich.  
work in Persia P-133
- Millstone** F-117, *picture* F-118
- Millville, N.J.**, manufacturing city 40 mi. s. of Philadelphia at head of deep-water navigation on Maurice River; pop. 14,806; glass products from glass sand obtained near by; cotton mill and bleachery; agriculture and poultry raising: *map* N-90
- Milman, Henry Hart** (1791-1868), English churchman, historian, and poet; dean of St. Paul's Cathedral, London ('History of Latin Christianity').
- Milne** (*mîln*), **Alexander** (born 1882), English dramatist, novelist, essayist, and writer of verses and stories for children; whimsical, humorous, with rare imaginative charm; educated at Cambridge; was assistant editor of *Punch* for eight years; served in 1st World War; afterwards devoted himself to writing ('When We Were Very Young', 'Winnie-the-Pooh', for children; 'Mr. Pim Passes By', 'The Dover Road', 'Michael and Mary', plays; 'Autobiography'; 'Two People', novel).
- Milner, Alfred, Viscount** (1854-1925), British statesman and colonial administrator; won international fame as high commissioner for South Africa 1897-1905, period which laid permanent foundations of British rule there; an Imperialist and Conservative, he opposed famous Lloyd George budget of 1909, but joined Coalition cabinet 1916 and except for Lloyd George took largest share in civilian war activities; secretary of state for colonies 1919.
- Milo** (*mî'lô*), or **Milon** (6th century B.C.), Greek athlete; crowned 6 times at Olympic Games and 6 times at Pythian for wrestling; carried an ox through stadium.
- Milo**. *See in Index* Melos
- Milo**, a variety of grain sorghum native to Africa; introduced into U.S. about 1880; grown over Great Plains region.
- Milreis** (*mêl-rê's*), former monetary unit of Brazil, worth at par 54.76 cents; replaced as coinage unit by cruzeiro in 1926, but retained as basis of foreign exchange; nominal value about 20 cents.
- Milroy, Robert Huston** (1816-90), American soldier, born Washington County, Ind.; served in Mexican War and in Civil War under Lee.
- Miltiades** (*mîl-tî'â-dêz*) (died 488? B.C.), Athenian general, victor over Persians at Marathon (490 B.C.) P-135
- Milton, John** (1608-74), English poet M-176-9, *pictures* M-176, 178, E-285 'Paradise Lost' M-179-80; meter used P-269; sum received for writing B-191  
poem inspired by Christmas C-229d quoted: 'L'Allegro' H-266; good books B-175; Shakespeare S-100c; slavery S-161  
'Samson Agonistes' M-180  
vocabulary E-282  
Wordsworth's tribute F-32
- Milton, Mass.**, suburb 7 mi. s. of Boston, on the Neponset River; pop. 18,708; settled in 1636; incorporated 1662; industrial center; chocolate, drugs, dyestuffs, pianos, artificial legs.
- Milvian** (*mîl'vê-ân*) **Bridge**, or **Mulvian Bridge**, ancient bridge over Tiber on Flaminian Way where Maxentius was drowned following his defeat by Constantine 312 A.D. C-346
- Milwau'kee, Wis.**, largest city of state;

Key—câpe, ât, fâr, fâst, whæt, fâll; mē, yēt, fērn, thêre; îce, bît; rōw, wón, fôr, nôt, dq; cûre, bût, ryde, fyll, bûrn;

- pop. 587,472: M-180-1, map W-124  
German element I-22  
Zoological Garden Z-223
- Milwaukee-Downer College**, at Milwaukee, Wis.; non-sectarian institution for women; Milwaukee College (founded 1851) and Downer College (founded 1855); united in Milwaukee-Downer College 1895; letters and science, music, home economics, art, occupational therapy.
- Milwaukee River**, in Wis., 100 mi. long; enters Lake Michigan at Milwaukee.
- Mime** (*mim*), a form of popular comedy developed in 5th century B.C. in S. Italy; portrayed events of every-day life by means of dancing, gestures, and witty dialogue; barred from public stage by Christian church but kept alive by strolling players; preserved comic element in drama during Middle Ages and Renaissance as found in the mystery plays, interludes, and dumb shows; traces still evident in modern pantomime and vaudeville: D-93
- Mimeograph**, trade-mark for stencil duplicator, machine for making multiple copies of documents; commonly but erroneously applied to stencil duplicating in general; consists of a stencil and a revolving, self-inking cylinder, turned by hand or by motor; paper fed at rate of several thousand sheets per hour; originated with Thomas A. Edison's electric pen in 1875 and Albert Blake Dick's "mimeograph" duplicator in 1884.
- Mimicry**, among animals, resemblance in physical structure or coloring to other animals or to natural objects of their environment; provides protection or concealment; includes protective coloration: P-353-4
- Mimic thrush** T-85, M-213
- Mimidae**, a family of perching birds embracing the mocking-birds and thrashers.
- Mimir** (*mē'mēr*), old giant in Norse mythology, guardian of the fountain of knowledge which watered the tree, Yggdrasil O-202
- Mimnermus** (7th century B.C.), Greek elegiac poet, the first to make elegiac verse a vehicle for love-poetry.
- Mimo'sa**, a small tree (*Albizia julibrissin*) with branched trunk, smooth gray bark, and feathery compound leaves, which fold up at night; small fragrant flowers with long pink stamens borne in dense spherical clusters that suggest powder puffs; native to Asia; cultivated for ornament in the U. S.; bark used for tanning sensitive leaves S-78
- Mimulus** (*mim'ū-lūs*), or monkey-flower, a genus of annual and perennial plants of the figwort family, found throughout world, often in moist places. Leaves oblong or oval; stems square; flowers tubular, seeming like tiny monkey faces, yellow spotted brown or white through red; Allegheny monkey-flower (*M. ringens*); common monkey-flower (*M. luteus*). See in *Index* Musk-plant
- Mī'na**, village near Mecca, Arabia M-103
- Mī'na**, my'nah, or myna, starling-like birds of the genus *Acridotheres*, family *Sturnidae*, native to India and the Pacific islands; some species, especially the Indian house mynah, are tamed and taught to speak; the true talking mynah of India (*Gracula religiosa*) belongs to the same family.
- Min'arets**, slender towers of mosques provided with balconies from which are issued the calls to prayer, *pictures* M-214, I-123
- Minas de Rio Tinto** (*mē'nās dā rē'ō tēn'tō*). See in *Index* Rio Tinto
- Minas Geraes** (*mē'nās zhē-ris'*) (meaning general mines), state of interior Brazil; 228,270 sq. mi.; pop. about 7,500,000; cap. Belo Horizonte; diamonds and other gems; gold, iron, manganese ores; live stock; coffee, rice, beans, tobacco: B-225, 226, 226a  
manganese deposit. *picture* S-208  
plateau, map B-226
- Minch**, strait separating Hebrides from n.w. coast of Scotland H-267, maps E-270a, E-279
- Mind** M-181. See also in *Index* Brain; Psychology
- Mindanao** (*mīn-dā-nū'ō*), southernmost and 2d largest island of Philippines; 36,906 sq. mi.: P-164, maps A-332c, P-10b, P-168  
coat of arms P-93, color plate F-87  
Moros in P-166
- Mind-cure**, or mental therapy M-109
- Mindel**, a glacial phase I-2b
- Mindel-Riss**, an interglacial period I-2b
- Min'den**, Germany, old town in w. on the Weser River 55 mi. s. of Bremen, near which English and Prussians defeated French (1759) in Seven Years' War: pop. 27,000: map G-66
- Mindoro**, 7th largest of Philippine Islands; 3794 sq. mi.; mountainous plateau reaching height of 8800 ft. in Mt. Halaon; sugar cane, forest products: maps A-332c, P-10b
- Mine**, submarine T-113-16, B-157  
mine layers and sweepers N-56, T-116: how named, table N-56a  
protection against T-116
- Mineola**, N. Y., county seat of Nassau County, Long Island, 4 mi. e. of New York City limits; pop. 10,064; railway junction and mercantile distributing center; packing plants and vegetable depots: map L-195
- Miner**, Jack (born 1865), Canadian naturalist, born of English parents at Dover Center, Ohio; known for efforts to protect wild life; established bird sanctuary at his home in Kingsville, Ontario, Canada.
- Mineral industries**, *Outline* I-76-7
- Mineral'ogy**, defined M-181
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- Mineral springs** W-46, S-263  
Hot Springs resort, Ark., *picture* A-298  
Indiana W-48  
Missouri M-207  
West Virginia W-74  
Wisconsin W-125  
Yellowstone Park Y-206, *picture* Y-205
- Mineral wax**, or ozokerite P-145, A-337 used in electrotyping E-243
- Mineral Wells**, Tex., health and vacationists resort 45 mi. w. of Fort Worth; pop. 6303; manufacture of medicinal crystals; hunting, fishing.
- Mineral wool**, a fibrous mineral material consisting of fine, interlaced fibers, made by blowing a jet of air or steam through molten slag, glass, or certain rocks; also called rock wool, slag wool, and glass wool, depending upon the raw material from which it is made; high percentage of dead air space makes it valuable for sound and heat insulation.
- Miner bee**, a solitary bee B-78
- Miner'va**, in Roman mythology, goddess of wisdom, identified with Greek Athena M-185, A-352-3. See also in *Index* Athena
- Mines**, Bureau of, U. S. U-230, M-189  
Alaska served by A-104  
employs geologists G-45  
promotes safety S-2c
- Mines and mining** M-185-9, *Outline* I-76. See also in *Index* principal minerals by name  
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strip mining C-286  
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working conditions: America C-286; ancient Greece S-160
- Mine sweepers and layers** N-56, T-116 how named, table N-56a
- Ming Dynasty**, the ruling dynasty in China from 1368 to 1644 C-221j  
capital at Nanking N-3  
Peking tombs P-102
- Minho** (*mēn'yō*), a river forming part of n. boundary of Portugal, 170 mi. long, map S-226
- Miniature**, in illumination of books and manuscripts B-178, color plates B-176a-b, 178a-b
- Minié** (*mīn'i-ā*) ball, a bullet F-50
- Minim**, unit of fluid measure, one-sixtieth of dram or 1/480th of a fluid ounce; roughly equal to one drop.
- Minims**, mendicant order founded 1454 by Francis of Paola; first known as "Hermits of St. Francis"; named Minims by Pope Alexander VI: M-236
- Mini'mum age in labor** C-205
- Minimum wage**, lowest wage which will secure to the worker and de-

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jeñ); zh=French j (z in azure); k=German guttural ch



- pendents physical efficiency and social decency; covers least cost of clothing, food, shelter, and medical care as determined by existing prices; some states of U.S. and foreign countries have boards to fix this wage, with more or less authority to compel employers to pay it: F-2, L-44d  
Fair Labor Standards Act R-146f  
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Mining. *See in Index* Mines and mining  
Mining engineering E-267. *See also in Index* Mines and mining education for M-189  
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Min'ion type T-172  
Ministerial government D-47  
Ministers, in diplomatic service D-70-1  
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Ministry, in government, body of administrative officers corresponding to U. S. cabinet C-3. *See also in Index* Cabinet  
Ministry, in religion V-324  
Minitari (mē-nē-tā'rē) Indians. *See in Index* Gros Ventres  
Minium, or red lead (Pb<sub>3</sub>O<sub>4</sub>), a red solid formed by heating lead oxide at 400° C. for some time; used on iron structures to prevent rusting.  
Mink, a weasel-like animal M-189  
Minneapolis, Minn., largest city of state; pop. 492,370: M-190, map M-192, pictures M-193  
Cappelin Memorial Bridge, picture B-243  
Federal Reserve Bank (9th) and district, map F-22  
flour mills F-120, M-190, pictures F-117, M-193  
Institute of Arts, table M-392  
Minnehaha Park M-190, picture M-193  
state university, picture M-191  
Minneconjou (mī-nī-kōn'zhō), a tribe of the Teton Sioux living chiefly in South Dakota; a few are in North Dakota.  
Minnehaha (mīn-ē-hā'hā) ("Laughing Water"), in Longfellow's poem 'Hiawatha', maiden loved by Hiawatha, picture M-193  
Minnehaha Falls, Minneapolis M-190  
Minnesinger (mīn-ē-zīng'ēr), wandering singers in medieval Germany M-310  
Tannhäuser T-9  
Minnesongs G-62  
Minnesota'ta, a state in n. cent. U.S.; 84,068 sq. mi.; pop. 2,792,300; cap. St. Paul: M-190-5, maps M-192, U-188b-c  
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nickname S-279  
Pipestone National Monument N-22d  
products M-191-4, chart M-192, list M-190  
Red River R-62  
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Minnesota, University of, at Minneapolis, Minn.; state control; established 1851 (present charter 1868); arts and science, law, medicine, dentistry, pharmacy, chemistry, engineering, architecture, agriculture, forestry, home economics, mines, metallurgy, education, business administration; general college graduate school  
Folwell Hall, picture M-191  
football stratagem F-151d  
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Minnesota River, tributary of Mississippi (450 mi. long), map M-192  
Minnetonka Lake, near Minneapolis, Minn. M-190, map M-192  
Minnowit, Peter. *See in Index* Minuit  
Minnow, name often applied to any small fish; technically to those of family Cyprinidae; usual length three or four inches although some members of the family grow to several feet in length  
gambusia destroys mosquitoes M-270  
Mino'an Age A-26, C-246  
Mino da Fiesole (mē'nō dā fē-ā'zō-lā) (1431-84), Italian sculptor (real name Mino di Giovanni) S-57  
Minor, Robert (born 1876?), American Communist party leader, journalist and cartoonist by profession, born San Antonio, Tex.; became associated with Communist movement in U. S., 1919; edited the *Daily Worker*; sent to prison for inciting riot in New York City, 1930; succeeded Earl Browder as general secretary of Communist party in U. S., 1941.  
Minor, in law, a person under legal age, which is 21 in England and generally throughout the U.S., though 18 for women in many states.  
Minor, in music, smaller or shorter; used of an interval which is a half-tone smaller than the corresponding major interval, of chords containing such intervals, and of scales and music in general in which such intervals predominate.  
Minorea (mē-nōr'kū), 2d largest of Balearic Islands; 260 sq. mi.; fine harbor at Mahón: B-17, map S-226  
Minorea, a breed of poultry P-338, picture P-337  
Minorites. *See in Index* Franciscans  
Minorities, national, racial groups forming lesser part of population of a country.  
Minor scales, in music S-198  
Minos (mī'nōs), in Greek mythology, king and lawgiver of Crete, son of Zeus and Europa, father of Ariadne; after his death, judge in underworld  
Daedalus myth D-1  
legend of Cretan bull H-282  
name given to Minoan Age A-26  
palace ruins C-394  
Theseus and the Minotaur T-79  
Minot, George Richards (born 1885), medical scientist, born Boston, Mass.; began teaching at Harvard, 1928; shared, with William P. Murphy and George H. Whipple, Nobel prize (1934) for discovery of value of raw liver or liver extract in the treatment of anemia.  
Minot, N. D., trade center on Souris River 200 mi. w. of Grand Forks; pop. 16,577; coal mining, flour milling, and manufacture of briquettes; state teachers college: map N-162  
Minotaur (mīn'ō-tgr), in Greek mythology, bull-headed man-monster, eater of human flesh; imprisoned by Minos in Cretan labyrinth: T-79  
labyrinth D-1, C-394  
Minot's Ledge, lighthouse L-132, picture B-199  
Min River, s.e. China, entering Formosa Strait; navigable in lower course  
Foochow F-139, picture F-139  
Minsk (mīnsk), U.S.S.R., capital of Byelorussian (White Russian) Soviet Socialist Republic, 430 mi. s.w. of Leningrad; pop. 240,000: map E-326e  
Minster, monastery church  
origin of term M-233  
'Minstrel Boy', an Irish folk-song F-134  
Minstrels, medieval bards M-310  
'Nibelungenlied' N-140  
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skalds N-166  
'Minstrelsy of the Scottish Border', collection of ballads by Scott S-48  
Mint, a genus of herbs M-195-6  
used with tea T-27  
Mint, United States M-196-7  
Mint camphor. *See in Index* Menthol  
Mintha, in Greek mythology M-195  
Min'to, Gilbert J. Elliott-Murray-Kynynmond, Earl of (1845-1914), English statesman; served in Riel Rebellion; governor general of Canada 1898-1904, and viceroy of India 1905-10.  
Minto, Lake, in n.w. Quebec; 485 sq. mi.: map C-50c  
Minuend, in subtraction S-316  
Minuet (mīn-yū-ēt'), in music, a musical form in triple time to accompany the small, light steps of a dignified dance, also known by same name; often part of a suite in symphony M-313  
Min'uit, or Minnewit, Peter (1580-1641), colonial official for Dutch and Swedish West India Companies; obtained right to settle on Manhattan Island from Wappinger Indians and built Fort Amsterdam 1626: N-121  
bargaining with the Indians, picture A-153  
leads Swedish people in Delaware colony D-41  
Minus, in mathematics A-285, 286  
Minuscule (mīn-ūs'kūl), lower-case alphabet B-177, A-135  
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Minute, why divided into 60 seconds B-5  
'Minute Man, The', statue by Daniel French L-100, picture S-63  
Minute-man plow, picture A-48  
Minute men, American colonial militia, so called because of readiness for action at a minute's notice  
flags: Bedford, Mass. F-99; Culpeper County, Va. F-98, color plate F-90  
Lexington and Concord L-100: Lexington, picture R-87  
Minutes, of clubs or societies P-80  
Miocene (mī'ō-sēn) period, in geologic time G-40, picture G-41  
Miquelon, French island, administered with St. Pierre. *See in Index* St. Pierre and Miquelon  
Mir (mēr), Russian village community R-181

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, bāt, rȳde, fūll, bārn;

Mirabeau (*mê-râ-bô'*), Honoré Gabriel Riqueti, Count (1749-91), French Revolutionary statesman M-197

Mirab'illite, a mineral, sodium sulphate M-183

Miracle-plays, religious plays of Middle Ages M-197, D-93

Spanish S-236

Miracle tale, in 'Canterbury Tales' C-161, 162

Miraflores (*mê-râ-flô'râs*) Locks, in Panama Canal P-53, map P-52, picture P-49

Mirage (*mê-râzh'*), an optical illusion M-198-9

Miramichi (*mîr-â-mê-shê'*) River, 2d largest river of New Brunswick; abounds in fish logging, picture C-54

Miranda, Francisco (1756?-1816), Spanish-American revolutionist, born Caracas, Venezuela; served with the French in the American Revolutionary War and later in the French Revolution, during which he was imprisoned; returning to South America in 1806 he initiated a revolution in Venezuela, but was captured by the Spanish in 1812 and died four years later in prison in Cadiz

dictator of Venezuela V-276

Miran'da, in Shakespeare's 'Tempest', daughter of Prospero T-44

Mirbeau, Octave (1850-1917), French novelist and playwright; his story of Norman peasants 'Lettres de ma Chaumière' (1886) had a wide appeal; noted for his plays ('Celestine'; 'Torture Garden'; 'Calvary'; and play produced in New York City in 1905 as 'Business Is Business')

estimate of Maeterlinck M-24

Miriam, Hebrew prophetess, sister of Moses (Exod. ii; xv, 20).

Mir Jaffa, or Jaffir, Indian general and ruler C-272

Miro (*mê-rô'*), Joan (born 1900), Spanish painter; early work influenced by Van Gogh, later painted abstractions, finally turned to surrealism; ingenious use of color, fine sense of design ('Dog Barking at the Moon'; 'The Farmer's Wife').

Mirror M-199, L-125-6

colonial A-172

heat, radiant, focused by H-262

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reflection, law of L-126

speculum metal A-132

Mirror galvanometer C-5

Mirror Lake, Yosemite Valley Y-207

'Misanthrope, Le' (*lû mê-zân-trôp'*), comedy by Molière (1666); kind and sensitive Alceste, because of the insincerity in conventional society, becomes a cynic and misanthrope (hater of mankind).

Misdemeanor, in law, a minor crime, less serious than a felony, punishable by fine, imprisonment, or both, in a city or county jail rather than in a penitentiary, and not involving the loss of citizenship.

'Misérables, Les' (*lû mê-zâ-râ'blû*) (The Unfortunates), novel by Victor Hugo, first published in 1862 H-353-4

Miserere (*mîz-ê-rê-rê'*), a musical setting of the 50th Psalm in the Vulgate beginning *Miserere Mei, Domine* (Have mercy upon me, O Lord); in architecture, projection on underside of medieval church seats which afforded support to a

person standing when the seat was turned up; also called Misericord.

Misericordia, College, at Dallas, Pa.; Roman Catholic institution for women, founded 1924; arts and sciences, music, home economics, secretarial science.

Mishawa'ka, Ind., manufacturing center 4 mi. e. of South Bend on St. Joseph River; pop. 28,298; automobiles, machinery, trunks, rubber goods, furniture.

Mish'na, part of Talmud H-267

Mis'pickel, or arsenopyrite, a mineral composed of iron, sulphur, and arsenic, containing 46 per cent arsenic and principal source of "white arsenic" of commerce; occurs in veins associated with various ores of gold, lead, tin, etc.; silver-white in color.

Misquah Hills, elevated region in n.e. Minnesota containing highest point in state (2230 ft.).

Missal, the book containing the service for the celebration of the mass.

Missel-thrush T-88

Missin'aibi River, Ontario, Canada; flows 265 mi. into Moose River: map C-50c

Missing link A-225

Mission, Captain, 17th century French pirate, famed for eloquence and courtly manners; derived socialistic ideas from an ex-priest named Carraccioli, his lieutenant, and founded ideal colony on island off Madagascar; drowned at sea.

Mission architecture, Spanish-American style developed particularly in California and the Southwest A-271, C-32, S-223, pictures C-34, S-222

old and new styles compared, pictures A-273

Ranchos de Taos, N. M., picture S-222

San Luis Rey, Calif., picture M-235

San Xavier del Bac, Tucson, picture A-291

Missionary Ridge, battle of (Nov. 25, 1863) C-157

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Missions, Christian C-233-4. See also in Index Christianity

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Grenfell, in Labrador G-177-8

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Junipero Serra S-24

Korea K-40

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Loyola, St. Ignatius L-210-11

Moody's mission in Chicago M-249

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North American Indians

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Patrick, St. P-89

Paul, St. P-90

Peter, St. P-141

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Xavier, St. Francis X-197

Missions, Mohammedan R-71

Missisauqua, tribe of Indians of Algonquian family; originally lived about Lake Huron and Georgian Bay in Canada; later, parts of tribe moved to vicinity of Detroit, w. New York, and Ontario peninsula.

Missisquoi River, in n. Vermont; runs through Canada for a few miles; flows into Lake Champlain; about 90 miles long: map N-86

Mississippi, a gulf state of U.S.; 47,716 sq. mi.; pop. 2,183,796; cap. Jackson: M-199-202, maps M-200, U-188c

Ackia Battleground N-20

agriculture M-200

bird, state B-122

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flower, state S-279

forests, national and state, table F-250

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name, origin of, and nickname S-279

national military memorials N-22f

natural features M-199

products M-200-2, chart M-200, list M-199

Mississippi, University of, at Oxford, Miss.; chartered 1844, opened 1848; liberal arts, science, engineering, pedagogy, medicine, law, pharmacy, music; graduate school.

Mississippian period, in geology G-40

Mississippi Bubble L-208

Mississippi College, at Clinton, Miss.; Baptist institution for men, founded 1826; arts and sciences.

Mississippi kite, a bird of prey K-26

Mississippi River, greatest river of North America and, including Missouri, one of the longest in the world (3,988 mi.) M-203-6, N-151, U-184, maps N-150a, b-c, U-188c

bridges: New Orleans N-100, picture B-240a; St. Louis S-9

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Falls of St. Anthony M-190

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floods M-204, 206, F-106a, b, c, picture F-106d

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Lake Pepin, picture M-191

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Mark Twain's writings T-168-9

mussel fisheries I-122

navigation M-206, R-111

New Orleans gateway N-100

Pike's expedition F-14

St. Louis bridges and barge lines S-9

steamboat traffic T-125, picture U-243

Mississippi Sea N-152

Mississippi State College, at State College, Miss.; founded 1878; agriculture, engineering, science, business, education, graduate school.

Mississippi State College for Women, at Columbus, Miss.; founded 1884; arts and sciences.

Missolonghi (*mîs-ô-lôn'jê*), also Mesolongion, town in w. Greece on

- Gulf of Patras; pop. 9000; brilliantly defended against Turks in War of Liberation 1822-26; scene of Byron's death.
- Missoula, Mont., center of lumbering, mining, and agricultural region, on Missoula River; 95 mi. n.w. of Helena; pop. 18,449: M-246, map M-243 state university, picture M-245
- Missouri (*mi-zŭ'ri*), a n. cent. state of U. S.; 69,674 sq. mi.; pop. 3,784,664; cap. Jefferson City: M-207-10, maps M-208, U-188c
- agriculture M-208, G-136
- bird, state B-122
- cities M-208-9, list M-207. *See also in Index* names of cities
- earthquake at New Madrid E-136
- education, St. Louis S-10
- flag F-92, color plate F-87
- flower, state S-279
- forests, national and state, table F-250
- history M-209-10
- Boone settles in B-192
- St. Louis founded S-10
- Missouri Compromise M-210-11
- fur trade F-226
- immigration I-22
- trails to West F-16
- Benton's influence B-96-7
- held in Union M-210
- manufacturing M-209: Kansas City K-7; St. Louis S-9-10
- minerals M-208: glass sand G-106; lead L-76
- Mormons M-258, 259
- mound-builders M-291
- name, origin of, and nickname S-279
- natural features M-207, O-266
- people M-209
- products M-208, chart M-208, list M-207
- rivers M-207, map M-208
- Missouri, University of, at Columbia, Mo.; state control; established 1839, opened 1841; arts and science, agriculture, education, graduate, law, medicine, engineering, journalism, business and public administration; mining and metallurgy at Rolla, Mo.
- Missouri Botanical Garden, at St. Louis, Mo. S-10
- Missouri Company, a fur-trading company F-226
- Missouri Compromise M-210-11
- Arkansas A-299
- Clay's part M-211
- Dred Scott Decision D-103
- Kansas-Nebraska Act repeals K-7
- Maine admitted under M-211
- Missouri Indians, or Missouri Indians, tribe of the Siouan stock which, after migrating from Wisconsin to Missouri and Nebraska, were removed to Indian Territory (Oklahoma) in 1832, when only a few remained: I-54
- Missouri River, chief tributary of Mississippi (2945 mi.) M-211-12, maps S-218, M-208
- Fort Peck Dam D-8, M-211
- Lewis and Clark explore L-99
- sediment M-211, chart M-205
- South Dakota S-217
- Missouri skylark T-99
- Missouri Valley College, at Marshall, Mo.; founded 1889 by Presbyterians; liberal arts and music.
- Mistassini (*mis-tā-sē'nē*), a lake in Quebec near the Height of Land; 120 mi. long: map C-50c
- Mister, or master, title used in polite address D-34
- Misti, South American hybrid animal, a cross between a female llama and a male alpaca.
- Mis'tictoe, a parasitic evergreen shrub M-212
- Balder legend B-16
- Christmas decoration C-227, 228, M-212
- sacred to Druids C-124
- seed dispersal S-75
- Mistral (*mēs-trāl'*), Frédéric (1830-1914), French poet, leader of Provençal literary revival ('Mireio'); Nobel prize winner 1904
- aids Fabre F-1
- Mistral (*mēs-trāl'*), Gabriela (born 1889), Chilean writer L-67u
- Mis'tral, a wind W-113
- Misurata (*mē-sū-rū'tā*), name of a province and a seaport city of Libya; pop. of city about 45,000: L-121b, map A-42a
- Mitchel Field, U. S. Army flying field 24 mi. e. of New York City.
- Mitchell, Donald G., pen name of Ik Marvel. *See in Index* Marvel, Ik
- Mitchell, John (1870-1919), American labor leader, born Braidwood, Ill., president of United Mine Workers of America, and vice-president of American Federation of Labor; leader of anthracite strike 1901-2; 1914 on New York State Workmen's Compensation Board ('Organized Labor').
- Mitchell, Margaret (Mrs. John R. Marsh), American novelist, born Atlanta, Ga.; for six years reporter on Atlanta *Journal*; 'Gone with the Wind', Pulitzer prize novel (1937), laid in Georgia during Civil War and reconstruction period: A-181
- Mitchell, Maria (1818-89), American astronomer and educator; professor at Vassar; made special studies of Jupiter, Saturn, and Sun; observatory in her memory at Nantucket; in Hall of Fame, New York City.
- Mitchell, S. Weir (1829-1914), American neurologist and novelist; developed 'rest cure' for nervous diseases ('Hugh Wynne'; 'Dr. North and His Friends').
- Mitchell, William E. (1879-1936), American army officer, born Nice, France; as captain in Signal Corps witnessed Wright brothers' flight at Fort Meyer in 1908; learned to fly under Orville Wright; brigadier general in command of U.S. air forces, 1st World War; court-martialed 1925 for outspoken criticism of the handling of military and naval aviation by his superiors; posthumously awarded rank of major general by U. S. Senate in 1942 after events of 2d World War justified his predictions of the rôle of air power in modern warfare ('Our Air Force'; 'Winged Defense').
- Mitchell, S. D., shipping point for farming region, 68 mi. w. of Sioux Falls; pop. 10,633; tile factory, packing plants; Dakota Wesleyan University: map S-218
- Mitchell, Mount, N.C. A-230, N-156
- Mitchison, Naomi. *See in Index* Haldane, John Scott
- Mites, tiny arthropods of the order *Acarina* S-258
- distinguished from insects I-87
- jigger S-258, picture P-68
- Mitford, Mary Russell (1787-1855), English novelist, best known for 'Our Village,' charming unpretentious sketches from life.
- Mithradates (*mīth-rā-dā'tēs*) I, king of Parthia, ruled 174-136 B.C.; founded the Parthian Empire; conquered Media Magna, Susiana, Persia, Babylonia, and Assyria proper, also took the Greek kingdom of Bactria from the Seleucids; allowed the subject kingdoms to rule themselves.
- Mithradates VI, or Mithridates the Great (132?-63 B.C.), king of Pontus, region in Asia Minor on Black Sea; waged three wars against Rome in attempt to free Asia Minor from Roman rule; finally, defeated by Pompey, he took his own life; exalted in legend for his culture, courage, and physical strength.
- Mithras (*mī'trās*), Persian god of sun and truth, whose worship was latest great Asiatic cult imported into Rome before establishment of Christianity; many resemblances to Christianity in doctrine and rites.
- Mitosis, in biology, name given to the process of cell-division H-283, pictures H-285, B-113
- Mitrailleuse (*mē-trā-yūz'*), French machine gun M-6
- Mi'tral valve, of heart H-258
- Mitre (*mē'trā*), Bartolomé (1821-1906), 'Grand Old Man of the Argentine'; soldier and statesman; as president 1862-68 carried out constitutional reorganization and encouraged immigration.
- Mitro'poulos, Dmitri (born 1896), American orchestral conductor and composer, born Athens, Greece; conductor Minneapolis Symphony Orchestra after 1937; wrote 'Soeur Beatrice', opera; orchestral, piano, and chamber music.
- Mitsubishi (*mēl'sg'bē'shē'*) family, famous Japanese mercantile family owning banks, mines, manufacturing, insurance, and shipping companies; important since early 18th century: J-188d
- Mitsui (*mīt-sg'i*) family, famous Japanese mercantile family, controlling large holdings; important since late 17th century: J-188c
- Mittelschule (*mīt'ēl-shg-lū*), German school G-74
- Mitylene, cap. of Lesbos, Greece. *See in Index* Mytilene
- Miwok (*mē'wōk*), a former group of many small Indian tribes which lived in w. cent. California.
- Mixed metaphor F-32
- Mixed number, in arithmetic F-167, 168, 169
- Mixer, electrical, picture E-236
- Mixture, in chemistry C-167
- Mizpah (*mīz'pā*), name of several places in Palestine; most important Mizpah of Gilead, where Jacob raised heap of stones and made covenant of peace with Laban. 'The Lord watch between me and thee, when we are absent one from another' (Gen. xxxi. 49). Because of this association the word 'Mizpah' has come to be used as a parting salutation and is used as a memorial inscription on rings.
- Mjöl'nir (*myäl'nēr*), in Norse mythology, hammer of Thor T-82
- Mnemosyne (*nē-mōs'i-nē*), in Greek mythology, goddess of memory; daughter of Uranus and Gaea, and mother of Muses M-305
- Mo'a, extinct bird of New Zealand, similar to emu; remains of 20 species found: picture T-19
- Mo'a, river in Cuba rising in e. end of Sierra Maestra Mts.; flows into Guantanamo Bay.
- Moab (*mō'āb*), or Mo'abites, Semitic tribe living in ancient Palestine e. of Dead Sea and the Jordan; frequently in conflict with Israelites; conquered by David
- alphabet, chart A-134a: Moabite stone, table A-134b
- modern P-37
- Ruth, the Moabitë R-201
- Moabite stone, slab of black basalt, dating from 9th century B.C., which bears ancient Semitic inscription describing victory of Mesha, Moab-

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērñ, thēre; īce, bīt; rōw, wón, fōr, nōt, dē; cūre, bāt, rēde, fūll, bārñ;



- ite king, over Israelites. Negotiations for its purchase by the French led to quarrels among the Arabs and it was broken; fragments now in Louvre, Paris.
- Moat (*mōt*), a ditch, often filled with water, around castle C-92, *picture* C-93
- Mobangi (*mō-bāng'gē*) River. *See in Index* Ubangi River
- Moberley, Walter (1832-1915), Canadian civil engineer, born Oxfordshire, England; came to Canada when a child; 1859 made superintendent of public works in British Columbia; 1871 had charge of surveys for Canadian Pacific Railway ('History of Cariboo Wagon Road'; 'The Early History of the Canadian Pacific Railway').
- Moberly, Mo., industrial city 132 mi. n.w. of St. Louis; pop. 12,920; coal mines near by; railroad shops; various manufactures; trade in live stock, hides, and farm produce; *map* M-208
- Mobile (*mō-bēl'*), Ala., seaport and 2d city of the state; pop. 78,720; M-212, *map* A-98, *pictures* A-98c, d attacked by Farragut F-13 history A-98f, M-212
- Mobile Bay, Ala., 27 mi. long, 8 mi. wide A-98d, f, *map* A-98
- naval battle F-13, *picture* C-255
- Mobile River, in s.w. Ala., *map* A-98 at Mobile M-212
- Mobilization, military and naval term for the assembling of army and fleet for war.
- 'Moby Dick', romantic novel by Herman Melville telling the adventures of Captain Ahab who, after losing a leg in first battle with Moby Dick, famous white whale, swears revenge; a three days' fight with Moby Dick ends in death of whale and sinking of ship illustration, *pictures* W-77, H-313
- Mocasin, Indian shoe, usually made of deerskin or other soft leather; often trimmed with beads or shells.
- Mocasin flower L-53
- Mocasin snake also called cotton-mouth M-212, V-302, *picture* S-170
- Mocha (*mō'kā*), or Mokha, fortified seaport in Yemen, s. Arabia, on Red Sea; 180 mi. w. of Aden; pop. 5000; gave name to Mocha gloves and Mocha coffee: A-238, *map* A-242
- Mocha coffee C-296, 298
- Mocha gloves G-107
- Mocha stone, an agate from India with a green or dark brown design resembling vegetation.
- Mochi, Feast of, annual rice festival in Japan, *picture* H-321
- Mockernut hickory, tree (*Hicoria alba*) of walnut family, native from Massachusetts to Florida and Texas. Grows to 90 ft.; leaves have 7 to 9 leaflets, to 7 in. long. Nuts light brown, thick-shelled, with small kernel. Wood strong, stiff, chiefly used for tool handles and vehicle parts; marketed as 'hickory.'
- Mocking-bird M-212-13, *color plate* B-139
- Mock-orange, or syringa, a shrub of the saxifrage family S-362
- Mock suns. *See in Index* Sun dogs
- Moctezuma River, in s. Mexico M-135, *map* M-133
- Mode, in statistics G-136f
- Mode, or mood, of verb V-281
- Model airplane, building and flying A-92-4, *pictures* A-92-4
- Modeling, in art books about H-313m sculpture S-65
- Model Law, or Audubon Law B-145d-146
- Model Parliament P-77
- Modena (*mō'dā-nū*), city in n. Italy 100 mi. e. of Genoa; cap. of province of Modena; pop. 91,000; fine Romanesque cathedral; famous campanile; university founded 1683: *map* I-156
- province joins United Italy I-157
- Moderato, direction in music meaning moderate.
- Modern history H-296, *chart* H-301-3, *Outline* H-310a-h
- Modernism, an artistic movement which emphasizes simplicity of design and suppresses incidental or merely decorative detail: F-42
- architecture A-273-4
- church at Tulsa, Okla., *picture* O-218
- Germany, *pictures* G-72, 75, B-99b, A-271
- Nebraska capitol, *picture* N-59
- New York World's Fair, *pictures* F-4b
- "pipe organ" church, Copenhagen, *picture* B-266
- Russia, *pictures* R-191
- Wright's work, *pictures* A-272b
- bookbinding B-183
- interior decoration, *pictures* I-105, 106, 107
- literature: Latin American L-67s-t
- painting P-26
- sculpture S-61-2, *pictures* F-42, S-62
- Modern Woodmen of America, a fraternal, beneficiary society, providing life insurance to members; founded at Lyons, Iowa, in 1883; the women's auxiliary is known as the Royal Neighbors of America.
- Modes'to, Calif., city in central California 70 mi. s.e. of Sacramento in rich fruit and dairy region; pop. 16,379; condensed milk, canned and packed fruits.
- 'Modest Proposal', satire by Swift S-343, 344
- Modifier, in grammar S-79
- Modigliani, Amadeo (*ā-mā-dā'ō mō-dēl'yā'nē*) (1884-1920). Italian painter; spent most of life in Paris; identified with the modern French school of art; highly individual in style and technique
- sculpture S-62
- Modjeska (*mō-jēs'kā*), Helena (1844-1909), Polish tragic actress, born Cracow; after successful career in Poland moved to California with her husband; performed in English after 1877 (Shakespearean rôles: 'Camille'; 'Mary Stuart') encouraged Paderewski P-11
- Mo'doc Indians, a small warlike tribe closely related to the Klamath, and originally living in n. California and s. Oregon; resisted U. S. soldiers three months in Modoc war of 1873, in quarrel over reservation; later removed to Indian Territory (now Oklahoma) and to Klamath reservation in s. Oregon
- lava beds furnish fortress N-22b
- Mo'dred, Sir, King Arthur's nephew and one of knights of Round Table R-160
- Modulation, in music M-311
- Modulation, in radio R-20, 21, 28a
- television T-41
- Moe (*mō'ē*), Jørgen Engebretsen (1813-82), Norwegian folklorist and poet; bishop of Kristiansand, collected folk-tales in collaboration with Peter C. Asbjørnsen; wrote lyric poems of delicate charm ('In the Well and the Churn'; 'A Little Christmas Present').
- Möen (*mā'ēn*), Danish island in the Baltic Sea between Zealand and Falster; 84 sq. mi.; pop. 14,000; fertile soil; farms and fisheries; chalk cliffs: *map* D-53
- Moench. *See in Index* Mönch
- Moero (*mō-ā'rō*), or Mweru, Lake, in s. cent. Africa on s.e. border of Congo State, *map* C-331
- Moesia (*mē'shī-ā*), ancient Roman province s. of Danube River corresponding to modern Bulgaria and e. Yugoslavia; settled by Goths about 376 A.D.
- Moffat, David Halliday (1839-1911), American banker, born Washingtonville, N. Y.; president First National Bank, Denver; promoted mining industry of Colorado.
- Moffat, Robert (1795-1883), Scottish missionary in Africa; father-in-law of David Livingstone; worked among Bechuana tribes 50 years and translated Bible into their language.
- Moffat tunnel, on Denver and Salt Lake Railroad; built 1923-27; named for David H. Moffat, builder of original railroad line: C-314, D-55, T-154
- Moffett Field, U. S. Army aviation base about 21 mi. s.e. of San Francisco, Calif.
- Mogadishu (*mō-gā-dē'shō*), also Mogadishu, seaport and cap. of Italian Somaliland, East Africa; pop. 50,000: *maps* E-308, A-42a
- Mogador (*mōg-ā-dōr'*), Morocco, seaport on Atlantic coast; active trade center; pop. 15,000: *map* A-127
- Mogok, town in Upper Burma; in valley 4000 ft. high; pop. 11,000.
- Mogul (*mō-gūl'*), Great, popular European name of Indian emperors descended from Baber, the first Great Mogul (died 1530) M-224
- Mogul Empire, in India M-224, I-38
- Clive and C-272
- peacock throne D-43
- royal buildings at Delhi D-43-4
- Mohács (*mō'hāch*), market town in s. Hungary on Danube River; pop. 17,000; coal and silk center; two battles, at the beginning and close of Turkish rule of Hungary
- battle of 1526 H-361
- Mohair, a cloth G-108
- Moham'med, or Mahomet (567-632), Arabian prophet, founder of Islam M-213-15. *See also in Index* Mohammedanism
- education E-171
- Koran K-38
- Mohammed II (1430?-81), sultan of Turkey 1451-81; educated, ambitious, brave, but ruthless gains Constantinople T-162
- Mohammed V (1844-1918), sultan of Turkey T-164
- Mohammed VI (1861-1926), sultan of Turkey, deposed 1922 by Nationalist Assembly T-164
- Mohammed Ali. *See in Index* Mehemet Ali
- Mohammedan architecture A-274
- Azhar Mosque, Cairo, *picture* C-17
- Constantinople Mosque, *picture* M-214
- India I-41
- Kadhinnain Mosque, Baghdad, *picture* I-123
- Kutb Minar, Delhi, *picture* D-42
- Moorish: Algeria, *pictures* A-125; Alhambra A-127, *picture* S-233; Grand Mosque fountain, Algiers, *picture* A-240; Ibero-American Exposition building, Seville, *picture* F-5
- Mosque of Omar, Jerusalem, *picture* A-329
- Mosque of Shah Jehan, Delhi, *picture* D-43

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

- palace in Lake Pichola, India, *picture* I-41  
 Pearl Mosque, Delhi D-43  
 Taj Mahal T-4-6, *picture* T-5  
 Teheran's porcelain gates, *picture* P-132  
 tomb at Agra, *picture* I-43  
 tower at Delhi, *picture* D-42  
 Mohammedanism, religion founded by Mohammed M-213-16. *See also in Index* Arabs  
 adherents, number of R-71, M-214  
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 Africa A-39, 40; Algeria A-125, 126; Egypt E-211, C-14; Morocco M-260; recent growth R-71  
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 children learning Koran, *picture* E-166  
 Crusades C-403-6, S-11-12  
 division by sects M-216  
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 holy cities in Iraq I-123  
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 Mecca, holy city M-102-3, M-213-14  
 Moors. *See in Index* Moors  
 Omar, Mosque of, Jerusalem, *picture* A-329  
 Persia P-132, 134  
 Philippine Islands P-166  
 prayer customs M-214  
 prayer rug R-171, *color plate* R-171a-b  
 "Sabbath" on Friday S-1  
 Saladin, leader S-11-12  
 slavery S-161  
 Syria S-362; Palestine P-36  
 Turkey T-161  
 university at Cairo C-14, *picture* C-17  
 women M-214, P-132, *pictures* A-37, B-19  
 wood-carving, *picture* W-136  
 Mohammed Zahir Shah (born 1914), king of Afghanistan; succeeded father Nadir Shah who was assassinated in 1933.  
 Mohave (*mō-hā'vā*). Desert, a desert region in s.e. California; 15,000 sq. mi.; entered first by Spanish priest 1776; many dry lakes; gold, silver, tungsten, borax, potash, and cement; agriculture possible in some sections; plants and animals peculiarly adapted to dry climate: U-182, *map* C-28  
 pure sodium borate deposits B-192  
 Mohave Indians. *See in Index* Mojave  
 Mo'hawk, leading Indian tribe of Iroquois group, formerly living in lower Mohawk Valley, N. Y. I-53  
 Mohawk River, in central New York, flows e. 175 mi. through fertile valley N-116, 118, 119, *map* N-114  
 route for early travel U-183  
 Mohegan (*mō-hē'gān*), Indian tribe of Algonquian stock, originally living in Connecticut, Rhode Island, and Massachusetts; after destruction of Pequots they were most powerful tribe in s. New England: I-53  
 Mohican. *See in Index* Mahican  
 Mohmand (*mō'mānd*), a tribe of Afghanistan and India A-29  
 Moholy-Nagy (*mō'hō-lī nāj*), Ladislaus (born 1895), Hungarian painter, photographer, stage designer, and architect; professor in original Bauhaus in Weimar and Dessau, Germany; voluntary exile from Germany after 1935; director New Bauhaus (later School of Design), Chicago.  
 Moire (*mū'ir* or *mū'ā-rā'*), silk or cotton cloth having a watered finish produced by engraved rollers, heat, and pressure.  
 Moissan (*mō'ā-sān'*), Henri (1852-1907), French chemist; developed electric furnace for laboratory use and simplified production of acetylene gas; isolated elementary fluorine; produced carborundum independently of Acheson's discovery; Nobel prize for chemistry 1906: I-116  
 artificial diamonds D-60  
 Moissi (*mō'ē'sē*), Alexander (1880-1935), German-speaking actor of international reputation, born Trieste (then in Austria) of Italian mother and Albanian father; made first stage appearance in Vienna; later played throughout Europe and in U.S. ('Hamlet'; Fedya in Tolstoy's 'Redemption'); noted for melodious and haunting quality of his voice.  
 Moisture. *See also in Index* Humidity  
 belts, physical C-270b  
 cause of moisture on outside of water vessels or pipes D-58  
 climate regions C-270b-271  
 factors in weather W-60  
 temperature variations affect C-270a-b  
 Mojarras (*mō-hār'ās*), one of group of heavy-bodied food fishes of small or moderate size (*Gerridae*), covered with large silvery scales; most of the species are American and abundant on both coasts.  
 Mojave (*mō-hā'vā*), or Mohave, tribe of Yuman stock living along lower Colorado River in Arizona and California; agricultural.  
 Mokal'la, Makalla, or Mukalla, important seaport in Hadhramaut, Arabia; pop. about 18,000: *map* A-242  
 Mokelumne (*mō-ki-lūm'nī*) River, in n. cent. California; flows into San Joaquin River; 200 mi. long.  
 Mokha, Arabia. *See in Index* Mocha  
 Moki Indians. *See in Index* Hopi  
 Mol, in chemistry A-10  
 Mola, Emilio (1888-1937), Spanish general, born in Cuba; served in Spanish army in Morocco, 1926; chief of police in Spain; next in command to Franco in Spanish civil war; said to have been originator of expression "fifth column," having used it in regard to his attack on Madrid; killed in airplane crash: S-231d  
 originator of expression "fifth column" W-178h  
 Molar solutions, in chemistry A-10  
 Molar teeth T-28, *pictures* T-29  
 Molasses S-320  
 alcohol made from A-112  
 beet molasses S-322  
 colonial trade A-158, 159  
 Diesel engine fuel, *picture* G-20  
 Molasses Act, British (1733) A-159, 160  
 modified (1764) R-82  
 Molay, Jacques de (died 1314), last grand master of the Knights Templars; born Burgundy; summoned to Paris by pope to answer charges brought against order, confessed truth of some; sentenced to life imprisonment recanted confession, and was burned to death.  
 Mold, fungus growth M-169-70  
 cheese C-164  
 killed by heat in canning C-74-5  
 Moldau (*mōl'dou*) River. *See in Index* Vultava River  
 Moldavia (*mōl-dā'vi-ā*), also Moldova, district in Rumania between Prut River and Carpathian Mts.; 14,710 sq. mi.; pop. 2,140,000: R-174  
 Moldavian Soviet Socialist Republic, 13th constituent republic of the U.S.S.R.; created 1940 by combining cent. Bessarabia, acquired from Rumania, with the autonomous Moldavian Republic which was formerly part of Ukraine.  
 Moldavite, a green natural glass possibly of meteoric origin; sometimes cut as gem; found in Moldavia and Australia.  
 Moldboard, of plow P-259  
 Molding press, for plastics P-245k, *picture* P-245j  
 Mole, a small insect-eating mammal M-216-17  
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 Molech. *See in Index* Moloch  
 Mole cricket C-397  
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 Molecular weights, in chemistry C-167a-b  
 Molecule (*mōl'ē-kūl*), two or more atoms chemically combined C-167, *picture* C-170  
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 Molenaar (*mōl'ē-nār*), Jan Miensze (1610-68), Dutch painter; scenes of peasant life; influenced by Frans Hals and Rembrandt  
 'Young Lady Playing the Harpsichord', *picture* P-210  
 Mole-shrew, or short-tailed shrew M-217  
 Moleskin, a strong cotton fabric with a heavy satiny pile; used for sports jackets, gloves, gun-cases.  
 Molesworth, Mary Louisa Stewart (1839-1921), English author of children's books; born in Holland ('Carrots', 'Cuckoo Clock').  
 Molière (*mōl'yēr*), stage and pen name of Jean-Baptiste Poquelin (1622-73), French dramatist M-217-18, *picture* F-195  
 Moline, Ill., manufacturing city in n.w. on Mississippi River adjoining Rock Island and just across river from Davenport, Iowa; pop. 34,608; numerous mills and factories; known especially for its manufacture of farm implements; good water power; coal fields near by.  
 Molino del Rey (*mō-lē'nō dēl rā*) ("king's mill"), Mexico, massive stone buildings 3 mi. w. of Mexico City; hotly fought battle in Mexican War (1847) resulting in Mexican defeat.  
 Mollendo (*mō-yēn'dō*), Peru, seaport for Arequipa; also a chief port for Bolivian commerce; Peru's main exporting-point for wool; pop. 11,000: *map* P-140  
 Mollison, James Allan (born 1905), English aviator; made first east-west n. Atlantic solo flight 1932.  
 Molluscoida (*mōl-ūs-koī'dā*), a phylum of animals Z-227  
 Mollusks, or Mollusca, a phylum of soft-bodied, unsegmented animals, usually bearing shells M-218-19  
 bivalve M-218: clams and mussels

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; ice, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rȳde, fūll, būrn;

- C-258-9; oyster O-262-6, P-97; scallop S-35-6; teredo T-52  
 cephalopod M-218: cuttlefish C-415-16; nautilus N-44; octopus C-417; squid C-416, S-265  
 gastropod M-218-19: snails and slugs S-167-8  
 shells S-106-8
- Mollwitz (*môl'vits*), Germany, village 25 mi. s.e. of Breslau, where Frederick the Great defeated Austrians under Marshal Neipperg (1741) in First Silesian War.
- Molly Maguires, a secret organization founded 1845 in Ireland to resist rent collectors; also a similar organization in mining districts of Pennsylvania, suppressed 1877 after execution of leaders for murders of mine officials.
- Molnár (*môl'nâr*), Ferenc (born 1878), Hungarian dramatist; keen sense of the dramatic, brilliant technique, and subtle irony; cynical and disillusioned in his attitude toward life; many of his plays produced in America ('Liliom'; 'The Guardsman'; 'The Swan'; 'Olympia'); also wrote novels ('The Pál-street Boys'), short stories, and essays: D-97
- Moloch (*mô'lôk*), or Molech, Semitic fire-god (II Kings xxiii, 10) P-174, T-151
- Molokai (*mô-lô-kû'ê*), island of the Hawaiian group; 261 sq. mi.; pop. 5340: H-241, 243, maps H-242, 243
- Molonglo River, small stream of New South Wales, Australia C-70
- Molotoff (originally Seriatin), Vyacheslav Mikhailovich (born 1889), Russian political leader; appointed commissar of foreign affairs of the U.S.S.R. 1939; president of the council of commissars (premier) 1930-41; joined Communist party at age of 17; editor of *Pravda* signs Nazi-Soviet pact, 1939, picture W-178d
- Molson, John (1764-1836), Canadian capitalist and pioneer in steam navigation, born Lincolnshire, England; emigrated to Canada 1782; 1809 ran steamship on St. Lawrence River; 1832 made member of Legislative Council; 1826-34 president of Bank of Montreal.
- Molting: birds B-129-30, D-116, F-20; caterpillars L-66, C-98
- Moltke (*môlt'kû*), Helmuth Johannes, Count von (1848-1916), German general, nephew of Count H. K. von Moltke; chief of staff at outbreak of 1st World War; superseded by Falkenhayn December 1914: W-154
- Moltke, Helmuth Karl, Count von (1800-91), Prussian field marshal and chief of staff, greatest strategist of latter 19th century; reorganizer of Prussian army; planned campaigns against Austria (1866) and France (1870-71); a strong reserved man, "silent in 7 languages"
- Bismarck B-147
- Franco-Prussian War F-188  
 quoted on Washington W-16
- Moluccas, or Spice Islands, group of islands in Netherlands Indies, between Celebes and New Guinea; 30,168 sq. mi.; pop. 615,000; export spices, sago, coconuts, pearls. Moluccas also name of administrative unit consisting of the residencies of Ambonia and Ternate and comprising the Molucca group and the whole of Dutch New Guinea. Total area of this unit, 191,682 sq. mi.; pop. 895,000: maps E-142a, P-10b  
 cloves C-282  
 Spanish-Portuguese dispute M-27-8
- Moluccan Sea, part of Pacific Ocean e. of Celebes, map A-332c
- Moly, fabled flower that protected Odysseus from Circe C-237
- Molybdenite (*mô-lib'dê-nit*), a soft sulphide of molybdenum (MoS<sub>2</sub>), chief ore of that metal; United States is principal world producer, largely from Colorado mines.
- Molyb'denum, a metallic chemical element; much of world's supply produced in Lake County, Colorado: C-176, table C-168
- alloys A-131
- electric furnace employs F-219
- filament supports in electric lamps E-234
- ore M-182
- Mombasa (*môm-bû'sâ*), Kenya Colony, chief town and seaport of British East Africa on island connected by causeway with mainland; pop. 50,000; railroad terminus; coaling station: E-138, maps E-139, A-42a  
 native quarters, picture A-41
- Momentum, the power of a moving body to overcome resistance; equals the mass of the body multiplied by its velocity: P-191
- Mommsen (*môm'zên*), Theodor (1817-1903), German classical scholar and historian, called by Freeman "well-nigh greatest scholar of all times"; his 'History of Rome', though biased in favor of monarchy, "one of most masterly histories ever written"; Nobel prize winner for literature 1903.
- Momotom'bo, active volcano of Nicaragua on n.w. shore of Lake Managua N-141
- Momus (*mô'mûs*), in Greek mythology, god of censure and mockery who found fault with everything and burst with spite because unable to find flaws in Aphrodite. Son of Night according to Hesiod.
- Monaco (*môn'û-kô*), Albert Honoré Charles, Prince of (1848-1922), ruler of the principality of Monaco and oceanographer; succeeded his father, Charles III, 1889; served in Spanish and French navies; made a number of voyages to investigate deep-sea life and sea currents
- Oceanographic Museum, picture M-247, table M-393
- Monaco, small principality on Mediterranean in s.e. France; about 370 acres; pop. 23,000; chief town, Monte Carlo: M-247
- flag F-96, color plate F-89
- Oceanographic Museum, picture M-247, table M-393
- Monadnock, Mount, in s. New Hampshire (3166 ft.) N-85, map N-86
- Monaghan, inland county in Ulster province, Ireland; 498 sq. mi.; pop. 61,000; chiefly agricultural.
- 'Mona Lisa' (*mô'nâ lê'sâ*), Da Vinci's great portrait, also called 'La Gioconda' V-300, picture E-333
- Mona Passage, West Indies, between Hispaniola and Puerto Rico; 80 mi. wide: P-310, map N-150c
- Monarch butterfly, or milkweed butterfly, color plate N-38a-b  
 food of larva M-174
- Monarchy (*môn'êr-ki*) (from Greek words *monos* meaning "alone" and *archêin*, "to be first, or to rule"), a form of government G-126, D-45  
 origin of kings G-125
- Monarda (*mô-nûr'dâ*), or horse-mint, a genus of plants of the mint family, including bergamot, bee-balm, or Oswego-tea.
- Monastery M-232, 233-4, pictures M-232, F-170. See also in Index
- Monks and monasticism  
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- Monastir (*môn-û-stêr'*), Yugoslavia. See in Index Bitolj
- Mon'azite sand, a brownish crystalline mineral containing phosphates of several rare earth elements, including thorium and cerium, used in gas mantles M-183  
 contains alabamine C-176
- Monbodo, James Burnett, Lord (1714-99), Scottish judge, anthropologist, and philosopher; his theories on man's evolution had similarities to later Darwinism; friend of Samuel Johnson and Robert Burns ('Of the Origin and Progress of Language'; 'Ancient Metaphysics').
- Mönch (*mûnk*) ("the monk"), a peak of the Bernese Alps (13,465 ft.) S-349
- Monck, Charles Stanley, 4th Viscount (1819-94), British statesman, born Ireland; governor general British North America (Canada) 1861-67; played important part in confederation of Canadian provinces into the Dominion, of which he was made first governor general 1867; returned to Ireland 1868.
- Monck, George. See in Index Monk
- Moncton, New Brunswick, Canada, city on Petitcodiac River, near Bay of Fundy; pop. 20,689; agricultural region; railroad workshops; woollens, lumber products, clothing, stoves: map C-50c  
 tide, picture T-92
- Mond, Sir Alfred. See in Index Melchett
- Monda'min, in Longfellow's 'Song of Hiawatha', personification of Indian corn.
- Monday, second day of week; named in honor of moon.
- Mondovi (*môn-dô'vê*), Italy, city 55 mi. w. of Genoa; scene of Napoleon's victory over Sardinians (1796).
- Monel metal N-143, C-361
- Mones'sen, Pa., industrial borough 21 mi. s. of Pittsburgh, on Monongahela River; pop. 20,257; steel and sheet and tin plate products.
- Monet (*mô-nê'*), Claude (1840-1926), French landscape painter, called chief "luminist" of the impressionist movement because he made light the sole problem of painting; first to use "broken colors," placing primary colors on canvas in small patches, side by side, instead of mixing paints on palette ('Haystacks'; 'Poplars'; 'Cathedrals'; 'Cliffs at Belle Isle'; 'Gardens'; 'Lily Pools'; 'Thames Bridge')  
 impressionism P-24  
 'La Grenouillère', picture P-25
- Moneta (*mô-nê'tâ*), a name, meaning good counsel (from Latin *monere*, "I advise"), given to Juno; also, name of temple built to her, in which money was coined; from moneta we have the English word mint.
- Money M-219-22. See also in Index
- Coins and coinage; Paper money  
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û=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch



## HISTORICAL VALUE OF FOREIGN MONEY

These figures show the values in the days of free gold exchange, when the U. S. Government fixed the value of gold at \$20.67 a troy ounce.

After 1934, when the United States went off the gold standard, following similar action by most other nations, gold was valued at \$35 a troy ounce. As a result the nominal values of foreign moneys and their actual exchange values came to differ widely and no permanent reference table of values can be given. The values given here serve to make clear the references in literature and historical documents. For current values of foreign money, newspapers or banks should be consulted.

COUNTRY	MONETARY UNIT	U.S. EQUIVALENT	COUNTRY	MONETARY UNIT	U.S. EQUIVALENT	COUNTRY	MONETARY UNIT	U.S. EQUIVALENT
Argentina.....	Peso.....	\$ .96½	Great Britain.....	Pound.....	\$4.86½	New Zealand.....	Pound.....	\$4.86½
Australia.....	Pound.....	4.86½	Greece.....	Drachma.....	.01½/10	Nicaragua.....	Cordoba.....	1.00
Belgium.....	Belga.....	.14	Guatemala.....	Quetzal.....	1.00	Norway.....	Krone.....	.26
Bolivia.....	Boliviano.....	.36½	Haiti.....	Gourde.....	.20	Palestine.....	Pound.....	4.86½
Brazil.....	Milreis.....	.54½	Honduras.....	Lempira.....	.50	Panama.....	Balboa.....	1.00
British Honduras.....	Dollar.....	1.00	Hong Kong.....	Dollar.....	.47	Paraguay.....	Peso.....	.96½
British West Indies.....	British money used		Hungary.....	Pengő.....	.17½	Persia (Iran).....	Kran.....	.08
Bulgaria.....	Lev.....	.0072	Iceland.....	Krona.....	.27	Peru.....	Sol.....	.49
Canada.....	Dollar.....	1.00	India, British.....	Ruppee.....	.36½	Philippine Islands.....	Peso.....	.50
Ceylon.....	British-India money used		Indo-China.....	Piastre.....	.47	Poland.....	Zloty.....	.11½
Chile.....	Peso.....	.12	Ireland (Eire).....	Pound.....	4.86½	Portugal.....	Escudo.....	1.08
China.....	Yuan dollar.....	.46	Italy.....	Lira.....	.05½	Rumania.....	Leu.....	.06
Colombia.....	Peso.....	.97	Japan.....	Yen.....	.50	Russia (U.S.S.R.).....	Chervonetz.....	5.14½
Costa Rica.....	Colon.....	.25	Latvia.....	Lat.....	.19½	Salvador.....	Colon.....	.50
Cuba.....	Peso.....	1.00	Liberia.....	Dollar.....	1.00	Spain.....	Peseta.....	.19
Denmark.....	Krone.....	.28	Liechtenstein.....	Swiss currency used		Straits Settlements.....	Dollar.....	.57
Dominican Republic.....	Dollar.....	1.00	Lithuania.....	Litas.....	.09½/10	Sweden.....	Krona.....	.27
Ecuador.....	Sucres.....	.20	Luxemburg.....	Belgian currency used		Switzerland.....	Franc.....	.19
Egypt.....	Pound.....	4.94	Madagascar.....	French currency used		Syria.....	Pound.....	.78
Estonia.....	Kroon.....	.26½	Mexico.....	Peso.....	.50	Thailand (Siam).....	Baht.....	.44
Finland.....	Markka.....	.02½	Monaco.....	French currency used		Turkey.....	Piastre.....	.04½
France.....	Franc.....	.03½/10	Morocco.....	Rial.....	.44	Union of South Africa.....	Pound.....	4.86½
Germany.....	Reichsmark.....	.24	Netherlands.....	Florin.....	.40	Uruguay.....	Peso.....	1.03
			Newfoundland.....	Dollar.....	1.00	Venezuela.....	Bolivar.....	.19
						Yugoslavia.....	Dinar.....	.19

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Mongibello (*mōn-gē-bēl'lo*), Sicilian name for Mt. Etna E-313  
Mongol Dynasty, or Yuen Dynasty, in China (1280-1367) M-223, C-221j  
Mongolia, territory between Siberia and China consisting of the Mongolian People's Republic and Inner Mongolia: M-222a-23, maps M-222c, C-211, A-332a, b  
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Mon'goose, or Mongoose, a weasel-like animal of India M-224  
Martinique M-72  
Mon'ists, school of philosophers P-173  
'Monitor', Civil War ironclad M-224-5, picture C-255  
Monitor, lizards L-171, picture L-170  
Monitor system, or Lancasterian system, of education E-177  
Monk, or Monck, George (1608-70), duke of Albemarle; English Cromwellian general; after Cromwell's death secured Stuart restoration without bloodshed through parliamentary action.  
'Monk, The', a romance by Matthew Gregory Lewis about a monk, Ambrosio, who becomes very sinful and finally sells his soul to the devil; book was so popular that author became known as "Monk" Lewis.

Monkey M-225-31. *See also in Index*  
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Monkey-bread tree, or baobab, a huge tropical tree T-136  
Monkey dinner-bell, or sandbox tree, tropical tree (*Hura crepitans*) native to Central and S. America. Grows to 100 ft.; branches spiny. Leaves oval, to 2 ft. long; flowers red; fruit about 3 in. across. Tree secretes a poisonous milky juice used by Indians to poison dart. Sometimes called assacu and dynamite tree. Wood, pale yellow or brown, soft, easily worked; used for furniture under name hura, or possum-wood: S-73, pictures S-74, P-244  
Monkey-flower. *See in Index* Mimulus  
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Key—cāpe, āt, fār, fāst, whāt, fāl; mē, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŭde, fŭll, bār; n

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Monkshood, aconite, or wolfsbane, perennial plants comprising the genus *Aconitum* of the crowfoot family; flowers showy, blue, white, or yellow, with 5 petal-like sepals of irregular size and shape, the upper one hood-shaped; some species yield drug *aconite*: P-275, *picture* P-273  
how to plant G-10

Monmouth (*môn'mūth*), James, Duke of (1649-85), English pretender to the throne, the "Protestant Duke," illegitimate son of Charles II; regarded as head of English Protestant party; captured in attempted rebellion and beheaded: J-183

Monmouth, Ill., city in agricultural region, 90 mi. n.w. of Springfield; pop. 9096; pottery, furnaces, dairy products; Monmouth College.

Monmouth, battle of, Revolutionary War battle, fought 1778 at Freehold, Monmouth County, N. J., 27 mi. e. of Trenton: R-90

Monmouth College, at Monmouth, Ill.: opened 1856; arts and science, music, art; United Presbyterian.

Monmouthshire, England, county e. of s. Wales; 546 sq. mi.; pop. 435,000; iron works; part of Wales until 1535; county seat Monmouth.

Monocacy (*mō-nōk'ā-cī*), Civil War battle, July 9, 1864; Confederates under Early defeated Union forces under Wallace on Monocacy River in w. Maryland near Frederick; national military park.

Monoceros (*mō-nōs'ēr-ōs*), or Unicorn, a constellation, *chart* S-275

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Monocle S-240

Monoclinic crystals M-182

Monocoque (*mō-nō-kōk'*) construction, in aeronautics A-79

Monocotyledons, plants S-75, P-244, *Outline* B-205

Monocytes, leucocytes B-157a

Monococious (*mō-nē'shūs*) plants F-121

Monogamy, a form of marriage F-8

Monometallism, a money system which has a single metal as standard; usually gold, but occasionally silver; opposed to bimetalism gold and silver systems M-221  
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Monomet'er, line in poetry P-269

Monomial, in algebra A-123

Monomorium, genus of ants A-213

Monongahela (*mō-nōn-gā-hē'lā*) River, flows 125 mi. through West Virginia and Pennsylvania; joins Allegheny at Pittsburgh to form Ohio: *maps* P-112, W-76  
coal traffic P-224

Monoplane, airplane with one pair of wings A-70, *pictures* A-66, 68, 70

Monopoly, control of a service or the supply of a commodity; usually includes the power to fix prices. *See also in Index* Competition; Government regulation of industry; Trusts, industrial

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Standard Oil Company: methods R-122; organization T-145  
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Monorail car G-192, *picture* T-126  
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Monosaccharide, any of several simple sugars having the formula (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>), and differing in structure of molecule; none can be split, as can more complex sugars, into simpler sugars: S-322

Monotheism, belief in one God ancient Egypt E-209

Hebrew religion B-102, R-72

Mohammed's teachings M-213

Monotremata, the order of primitive egg-laying mammals Z-229

Monotype M-237-9

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Monroe, Elizabeth Kortright (1768-1830), wife of President Monroe W-90

Monroe, Harriet (1860-1936), American poet, born Chicago; founder (1912) and editor of *Poetry*, a magazine of verse, which gave impetus to Renaissance of American poetry; author of several volumes of poetry and of autobiography. 'A Poet's Life'.

Monroe, James (1758-1831), 5th president of U. S. M-239-41. *See also in Index* Missouri Compromise; Monroe Doctrine  
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negotiates Louisiana Purchase M-240, L-209

wife W-90

Monroe, Paul (born 1869), American educator, born North Madison, Ind.; professor of education, Teachers College, Columbia University; educational adviser for China; editor, 'Cyclopedia of Education' ('Text Book in the History of Education').

Monroe, La., port on Ouachita River, 97 mi. e. of Shreveport; pop. 28,309; cotton-raising, farming, lumbering, and large natural gas distribution; carbon black, lumber products, paper: *map* L-206

Monroe, Mich., city 35 mi. s.w. of Detroit on Raisin River, 2 mi. from Lake Erie; pop. 18,478; agricultural region; automobile accessories, lumber, paper, steel, nurseries, fisheries, and limestone quarry; airport; battle of Frenchtown fought here (1813): *map* M-153

Monroe Doctrine M-241-2

Bolivar aided by B-168

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Monroe Doctrine of the East P-8-9

Monrovia (*môn-rō'vī-ā*), Calif., city 15 mi. s.e. of Los Angeles in foothills of San Gabriel Mountains; pop. 12,807; shipping point for citrus fruits; health center.

Monrovia, seaport and cap. of Liberia, Africa; pop. 10,000: L-101

Mons (*mōns*), mining and manufacturing city in s.w. Belgium 35 mi. s.w. of Brussels; pop. 28,000; defeat of British by Germans here in World War, Aug. 23, 1914, and of French at Charleroi, left way open for invasion of France: W-154, *map* B-87

Monsieur (*mūs-yū'*) (my lord), French title of polite address to a man.

Monsoon', a seasonal wind of Asia W-113

ancient navigation I-51

Burma B-278a

China C-211-12

East Indies E-142a

India I-33

Indo-China I-73a

Japan J-186d

Manchuria M-50

Mexico M-134-5

Philippines P-165

Thailand T-73a

Monsters

baluchitherium E-344

blue whale largest, *picture* W-79

Cyclops, in Greek mythology U-281  
prehistoric animals A-204-10

Montagnais (*mōn-tān-yā'*), a group of Algonquian Indian tribes of Canada, occupying the country from St. Maurice River almost to the Atlantic and from the St. Lawrence to the watershed of Hudson Bay.

Montagu (*mōn-tā-gū*), John. *See* Sandwich, John Montagu, Earl of

Montagu, Lady Mary Wortley (1689-1762), English beauty, wit, letter-writer, and eccentric; introduced smallpox inoculation into England.

Montague, Charles Edward (1867-1928), English journalist and novelist; for years on staff of *Manchester Guardian*; noted for liberal views and trenchant style ('A Hind Let Loose'; 'Right Off the Map', social and political fantasies; 'Dramatic Values', criticism).

Montague, in Shakespeare's 'Romeo and Juliet', Romeo's family, at feud with Capulets R-146

Montaigne (*mōn-tān'*), French *mōn-tān'yū*, Michel Eyquem de (1533-92), French essayist M-242, E-303  
influence on French language F-196

Montalembert (*mōn-tā-lān-bér'*), Charles Forbes René de (1810-70), French publicist and historian; Roman Catholic Liberal leader ('St. Elizabeth of Hungary').

Montana (*mōn-tā-nā*), state in n.w. U. S.; 147,138 sq. mi.; pop. 559,456; cap. Helena: M-242-6, *maps* M-243, U-188b  
agriculture M-244

bird, state B-122

cattle ranges C-108, 115

cities M-246, list M-242. *See also in Index* names of cities

dam, Fort Peck D-8, M-211, *table* D-357

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flower, state S-279

forests, national and state, *table* F-250

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 natural features M-242, 244  
 products M-243-4, 246, chart M-243,  
 list M-242, pictures M-245: pre-  
 cious stones G-29  
**Montaña** (*môn-tā'nyā*), name applied  
 to mountain districts in Spain and  
 to forested regions of the Andes in  
 South America  
 Peru S-208f  
**Montana grayling**, a fish T-145  
**Montana State College of Agriculture  
 and Mechanic Arts**, at Bozeman,  
 Mont.; founded 1893; agriculture,  
 engineering, applied science, house-  
 hold and industrial arts; part of  
 Montana state university.  
**Montana State University**, at Missoula,  
 Mont.; opened 1895; arts and  
 science, forestry, journalism, law,  
 etc.: M-246, picture M-245  
**Montargis** (*môn-tār-zhē*), France,  
 town 63 mi. s.e. of Paris; pop.  
 14,000; famous for "dog of Mont-  
 argis," said to have revealed  
 master's murderer by constantly  
 following him; Mirabeau born at  
 the Château de Bignon near by.  
**Mont Blanc**. See Blanc, Mont  
**Montbretia**, a genus of plants. See in  
 Index Tritonia  
**Montcalm**, Marquis Louis Joseph de  
 (1712-59), French general M-246  
 tomb Q-6  
**Mont Cenis Tunnel**, through Alps  
 T-154  
**Montclair**, N.J., residential town 7 mi.  
 n. of Newark and 15 mi. n.w. of  
 New York City; pop. 39,807; on first  
 range of Orange Mts.; state teachers  
 college: map N-90  
**Monte** (*môn'tā*), in South America, a  
 high region having scanty rainfall  
 S-208h, map S-208d  
**Montebello** (*môn-tā-bē'lō*), village in  
 n. Italy 40 mi. n. of Genoa, where  
 French defeated Austrians 1800 and  
 1859.  
**Monte Carlo** (*môn'tē kār'lō*), town in  
 principality of Monaco; pop. 10,000:  
 M-246-7  
**Monte Cris'to**, small barren Italian  
 island in Mediterranean, about 25  
 mi. s. of Elba; penal colony since  
 1874. See also in Index 'Count of  
 Monte Cristo'  
**Montefiore** (*môn-tē-fī-ō'rē*), Sir Moses  
 (1784-1885), Jewish philanthropist  
 in England; amassed fortune on  
 London stock exchange and after  
 his 43d year devoted all his time  
 to improving condition of Jews,  
 particularly in Russia and Turkey.  
**Montemezzi** (*môn-tā-mēd'zē*), Italo  
 (born 1875), Italian composer  
 of a cantata and several operas  
 'L'Amore dei tre re' (The Love of  
 Three Kings), story O-229, pic-  
 tures O-231, 233  
**Montenegro** (*môn-tē-nē'grō*), small  
 country in n.w. Balkan Peninsula;  
 3733 sq. mi.; pop. 200,000: M-247,  
 Y-212, map B-18  
 Balkan Wars B-20  
 folk-dance, picture F-133  
 printing introduced P-347  
 World War (1st) W-157  
 World War (2d) M-247  
**Montenotte** (*môn-tā-nō'tā*), village  
 25 mi. w. of Genoa, Italy, where  
 Napoleon won first victory (1796),  
 defeating Austrians.

**Montereau** (*môn-trō*), France, town  
 on Seine River 45 mi. s.e. of Paris;  
 pop. 9000; near Montereau, Napo-  
 leon defeated Allies in 1814.  
**Monterey** (*môn-tēr-ā*), Calif., resort  
 on Monterey Bay, about 100 mi. s.e.  
 of San Francisco; pop. 10,084; fish-  
 ing and canning interests; pic-  
 turesque old Spanish buildings; first  
 cap. of California; U. S. Army post:  
 maps C-26, 28  
**Monterey pine**, rare evergreen tree  
 (*Pinus radiata*) of pine family,  
 native to s. California coast region  
 and Guadalupe Island, Mexico.  
 Grows 40 ft. to 100 ft. high. Rough  
 dark brown bark; crown round-  
 topped; leaves in threes, to 6 in.  
 long, dark green; cones oval,  
 slightly curved, to 7 in. long, re-  
 main on tree for several years.  
 Ornamental.  
**Monterrey** (*môn-tēr-rā*), railroad and  
 manufacturing center in n.e. Mex-  
 ico, cap. of Nuevo León state; pop.  
 135,000; captured by Gen. Zachary  
 Taylor (1846) in Mexican War:  
 M-142, maps M-133, U-188b  
 manufactures M-142  
**Monte Rosa** (15,217 ft.), Alpine peak  
 S-349, map S-351  
**Montesquieu** (*môn-tēs-kū*), Charles  
 Louis de Secondat, Baron de (1689-  
 1755), French political philosopher;  
 called founder of science of com-  
 parative politics and philosophy of  
 history; 'Lettres persanes' (Persian  
 letters) satirizes the social, political,  
 religious, and literary follies of  
 his day; 'Esprit des lois' (Spirit of  
 Laws), a lengthy treatise on laws  
 on politics P-294  
**Montessori** (*môn-tēs-sō'rē*), Maria  
 (born 1870), Italian educator and  
 psychiatrist M-247-8  
**Monterverdi** (*môn-tā-vēr'dē*), or Mon-  
 teverde (*môn-tā-vēr'dā*), Claudio  
 (1567-1643), Italian composer,  
 born Cremona; his innovations, in-  
 cluding use of unprepared dis-  
 sonances, led way to modern music;  
 wrote church music, operas  
 ('Orfeo'; 'Arianna'): O-228  
**Montevideo** (*môn-ti-vid'ē-ō*), Spanish  
 (*môn-tā-vē-dā'ō*), cap. of Uruguay;  
 pop. 695,000: M-248, U-261, 262,  
 maps S-208c, d, U-262  
 commerce U-262  
 Plata River P-246  
**Montezuma II** (1466-1520), last Aztec  
 chief or "emperor" of Mexico A-408,  
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 Cortez conquers C-372, 373  
 welcomes Cortez, picture A-145  
**Montezuma Castle**, Ariz., a national  
 monument N-22b  
**Montfaucon** (*môn-fō-kōn*), hill 13 mi.  
 n.w. of Verdun, key to German first  
 line in Meuse-Argonne; captured by  
 Americans Sept. 27, 1918.  
**Montfort**, Simon de (1200?-65), earl  
 of Leicester, English statesman and  
 soldier: M-248-9  
 advanced growth of democracy D-47  
**Montgolfier** (*môn-gōlf-yā*), Jacques  
 Etienne (1745-99) and Joseph  
 Michel (1740-1810), brothers,  
 French inventors of balloon B-21,  
 picture B-23  
**Montgomery**, Sir Bernard Law (born  
 1887), British army officer after  
 1908, born Ireland; served in  
 France 1939-40, and as head of  
 Southeastern command in England  
 Dec. 1941-Aug. 1942; led 8th Army  
 in North Africa and Italy; named  
 commander of British armies for in-  
 vasion of Europe Dec. 1943.  
**Montgom'ery**, David (1870-1917),  
 comedian, born St. Joseph, Mo.;  
 associated with Fred Stone 1895-

1917 and played in 'Wizard of Oz',  
 'The Red Mill', 'Chin Chin', 'The  
 Lady of the Slipper'.  
**Montgomery**, James (1771-1854).  
 British poet; of his 'Wanderer in  
 Switzerland', Byron said it was  
 worth a thousand 'Lyrical Ballads';  
 humanitarian sentiments inspired  
 his verse; more than 100 hymns by  
 him still in use.  
**Montgomery**, Lucy Maud (Mrs. Ewan  
 Macdonald) (1874-1942), Canadian  
 novelist, born Prince Edward Is-  
 land C-66  
**Montgomery**, Richard (1736-75),  
 American soldier, born Ireland; ap-  
 pointed brigadier general in Con-  
 tinental army 1775, and with Bene-  
 dict Arnold led futile attack on  
 Quebec Dec. 31, 1775; killed almost  
 at first shot.  
**Montgomery**, Ala., state cap.; pop.  
 78,084; near center of state on Ala-  
 bama River; manufacturing and  
 railroad center and important in-  
 land cotton, livestock, and dairy  
 products market; ships grain,  
 syrup, fruit, and vegetables; lumber  
 and timber products, fertilizer;  
 Huntingdon College, state teachers  
 college for Negroes; Maxwell Field,  
 army air base: map A-98  
 capitol, picture A-96  
 first capital of Confederacy C-329,  
 picture A-98f  
**Montgomeryshire**, inland county in  
 central Wales; 797 sq. mi.; pop.  
 48,000; county town Montgomery;  
 climate mild and soil fertile, es-  
 pecially in Severn Valley; here Eng-  
 lish is almost unknown language.  
**Montgomery Ward & Co.**, mail-order  
 house, founded in Chicago by Aaron  
 Montgomery Ward 1872; retail store  
 system added in middle 1920's.  
**Month**, in calendar M-249  
 changes in number of days C-22  
 origin and names  
 January J-183  
 February F-21  
 March M-61  
 April A-233  
 May M-91  
 June J-228  
 July J-228  
 August A-363  
 September S-79  
 October O-201  
 November N-184  
 December D-23  
**Montherlant** (*môn-tēr-lān*), Henri de  
 (born 1896), French writer F-198  
**Montholon** (*môn-tō-lōn*), Charles  
 Tristan, Marquis de (1782-1853).  
 French soldier, devoted to Na-  
 poleon, whom he accompanied to  
 exile at St. Helena; to him Na-  
 poleon dictated notes on his career.  
**Monti** (*môn'tē*), Vincenzo (1754-  
 1828), Italian poet and dramatist  
 ('Aristodemo'; 'Bassevilliana').  
**Monticel'lo**, Va., Thomas Jefferson's  
 home J-209, picture J-207  
**Montmagny**, Charles Jacques Huault  
 de (flourished 1622-54), French  
 soldier, governor of New France  
 1636-48; built fort on Richelieu  
 River to check Iroquois; made peace  
 with Iroquois 1645.  
**Montmartre** (*môn-mār'trū*), name  
 given to a section of the Latin  
 Quarter in n. Paris.  
**Montmorency** (*môn-mō-rān-sē*), fa-  
 mous French family of which most  
 distinguished members were Mat-  
 thieu II (1189-1230) called "the  
 Great Constable," a successful war-  
 rior; Anne de Montmorency (1493-  
 1567), distinguished in wars of  
 Francis I; Henry II, duc de Mont-  
 morency (1595-1632), admiral of

Key—cāpe, āt, fār, fāst, whqt, fql; mē, yēt, fērn, thēre; ice, bīt, rōw, won, fōr, nōt, dq; cūre, būt, ryde, fūll, būrn



- France and viceroy of Canada, successfully fought against Huguenots, but was executed for treason through influence of Richelieu. Two members of family, the Duke of Montmorency-Laval and his father, fought in American Revolution.
- Montmorency, François Xavier de Laval.** See in *Index* Laval-Montmorency
- Montmorency, Falls of, Canada,** beautiful cascade over 250 ft. high in Montmorency River at confluence with St. Lawrence near Quebec.
- Montpelier,** home of James Madison in Virginia, about 20 mi. n.e. of Charlottesville; Madison lived most of life there except when away on official duties.
- Montpe'lier, Vt., cap.,** on Winooski River, in agricultural region; pop. 8006; traveling derricks, wood products, granite, flour, leather: map N-86
- capitol,** picture V-285
- Montpellier (môn-pêl-yâ'),** city in s. France 6 mi. from Mediterranean; pop. 90,000; noted university; large trade in wine, fruit, and silk; makes soap, candles, leather, distilled liquors.
- Montreal (môn-trê-gl'),** Quebec, largest city of Canada; pop. 818,577: M-249, Q-4, map C-50c
- American Revolution R-89**
- Cartier C-90**
- early fur trade L-66**
- Montreal Harbor Bridge, table B-342**
- museums, table M-392, 393**
- St. Lawrence River S-8**
- Montreal, University of, at Montreal, Quebec;** Catholic; established 1876 as branch of Laval University, Quebec; practically independent after 1889, and reorganized under present name 1919; arts, law, medicine, theology, social, political, and applied sciences; post-graduate schools in philosophy, literature, and pure science; special schools of commerce, agriculture, dentistry, veterinary surgery, hygiene, optometry.
- Montreux (môn-trû'),** Treaty of (1936), signed by the members of League of Nations authorizing Turkey to fortify the Dardanelles and to close them if Turkey should be at war; guaranteed free commerce through the Dardanelles in peace, and in war if authorized by the League.
- Montrose', James, Duke of** (died 1742), Scottish leader, favored union of Scotland and England; regent of kingdom on death of Queen Anne
- Rob Roy R-120**
- Montrose, James Graham, Marquis of** (1612-50), Scottish Jacobite general; signed Covenant of 1637 but believed in subordination of church to state; joined Royalists 1640, and won many victories against Covenanters; except Cromwell greatest soldier of Civil War; betrayed, imprisoned, hanged as a traitor by order of Scottish parliament; wrote many poems (celebrated lyric, 'My Dear and Only Love').
- Monts (môn),** Pierre du Guast, Sieur de (1560-1611), French courtier, founder of Acadia; sent out expedition under Champlain which founded Quebec.
- Mont Saint-Michel (môn sîn mē-shêl') (St. Michael's Mount),** rocky island of n.w. France a mile off coast of Normandy; famous for fortress-abbey, one of the noblest examples of medieval Gothic architecture: picture F-170
- Montsec (môn-sêk'),** an isolated height 8 mi. e. of Saint-Mihiel and overlooking s. face of Saint-Mihiel salient; captured by Americans Sept. 12, 1918, in Saint-Mihiel offensive: picture-map W-167
- trenches, picture W-160**
- Montserrat (môn-t-sê-rât'),** in British West Indies, one of Leeward Islands; 32 sq. mi.; pop. about 14,000, mostly Negroes; Soufrière, an active volcano.
- Montserrat, jagged mountain** 30 mi. n.w. of Barcelona, Spain; vast fissure, dividing it, said to have occurred at time of Crucifixion; famous monastery, in medieval legend the castle of the Holy Grail, now houses celebrated image of Virgin, visited by thousands of pilgrims yearly.
- Montt (môn),** Manuel (1809-80), Chilean statesman, president during "decade of Montt," 1851-61, which by establishment of modern communications, schools, and banks, laid foundation for subsequent Chilean prosperity; president of Supreme Court 1861-80.
- Monulph, Saint** (6th century), bishop of Tongres
- founds Liège L-123**
- Monumental City, Baltimore, Md. B-34**
- Monuments, national, in U. S., list N-20-22c**
- Monument Valley, Ariz., picture A-291**
- Monvel, Louis Maurice Boutet de.** See in *Index* Boutet de Monvel
- Mood, or mode, of verb V-281**
- Moodie, Mrs. Susanna** (1803-85), Canadian author; wrote poems and novels of Canadian life: C-65
- Moody, Dwight Lyman** (1837-99), American evangelist M-249
- influences Grenfell G-177**
- Moody, William Vaughn** (1869-1910), American poet and dramatist, born Spencer, Ind.; taught English at University of Chicago; famous poems are 'Gloucester Moors' and 'Ode in Time of Hesitation' ('The Great Divide', play; 'The Masque of Judgment' and 'The Fire-Bringer', poetic dramas): picture A-180
- Moody Bible Institute, an interdenominational, evangelistic organization, founded in Chicago** 1889; trains lay-workers for Sunday school and missionary work; publishes *Moody Monthly*
- Moody, Dwight L., founder M-249**
- Mook, Hubertus J. van** (born 1894), Dutch statesman, born Java; appointed lieutenant governor general of the Netherlands Indies Jan. 1, 1942, formerly director of economic affairs: picture E-143
- Moon, Grace Purdie, American author of Pueblo Indian tales for children; born Indianapolis, Ind. ('Indian Legends in Rhyme'; 'Chi Wee'; 'Nadita'; 'The Magic Trail').**
- Moon M-250-5**
- distance from earth M-250**
- eclipses E-144, M-250**
- gravity M-254, N-110, pictures M-252, G-142**
- lunar month M-249**
- Monday named for D-21**
- motion A-342**
- origin and age E-130, M-252**
- phases through the month, diagram M-254**
- precession of equinoxes E-133-5**
- tides T-90-2, M-255**
- Moon, Mountains of the, name given in ancient geography to African range identified in part with Ru-**
- wenzori Mts. A-38**
- fabled source of White Nile N-146**
- Moon dogs. See in Index** Sun dogs
- Mooney, Thomas J. (1883-1942),** American labor agitator, sentenced to death and later to life imprisonment for participation in bomb killings in Preparedness Day celebration in San Francisco 1917; sentence caused much public resentment; pardoned 1939.
- Mooney, William** (died 1832), organizer of Tammany Society T-7
- Mooneye, shad-like fish of family Hiodontidae, with brilliant silvery scales and strong teeth, inhabiting the rivers of central North America; a good sport fish but not very edible.**
- Moonfish, a small bright and silvery fish (Vomer septapinnis), with a greatly compressed and distorted body; common on the South Atlantic coast of U. S. Also a less common fish (Lampris regius) of large size and gorgeous coloration—a rich brocade of silver and lilac with vermilion jaws and fins—sometimes called opah and mariposa; delicious flavor: A-233, 234**
- Moonflower, a climbing garden plant (Ipomoea or Calonyction) closely related to the morning glory; has very smooth stems with soft, almost prickly, projections; leaves heart-shaped; large white or purple, fragrant flowers open in the evening and close before noon the next day.**
- Moon-goddess, in Greek mythology H-268, A-311. See also in Index** Artemis
- Moonlight schools, schools for adult illiterates held originally on moonlight nights by volunteer teachers; first founded in Kentucky by Cora Wilson Stewart in 1911; later in other states.**
- 'Moonlight Sonata', musical composition by Beethoven 1802, forming the second sonata of Opus 27, C Sharp Minor; Beethoven called it 'Sonata quasi una fantasia'. The first movement reminded a critic of moonlight on Lake Lucerne; hence the title 'Moonlight Sonata' motion picture P-11**
- Moonstone, a semiprecious stone G-28**
- Moonwort. See in Index** Lunaria
- Moor, Emanuel, inventor of double-keyboard piano P-212**
- Moor, waste land, either dry or swampy**
- swamp and sphagnum moors W-49**
- Moore, Anne Carroll** (born 1871), American librarian and critic; superintendent of work with children, New York Public Library. 1906-41; lecturer and writer on children's books ('My Roads to Childhood'; 'The Three Owls').
- Moore, Clement Clarke** (1779-1863), American poet and educator, born New York City; was professor of Biblical learning in General Theological Seminary, New York (1821-50) and compiled a 'Hebrew and English Lexicon', but is remembered chiefly for his poem 'A Visit from St. Nicholas' ("Twas the night before Christmas") written for his children in 1822.
- Moore, Mrs. Frederick F. See in Index** Gates, Eleanor
- Moore, George** (1852-1933), Irish novelist and dramatist; follower of French school of realism; highly individualistic work appreciated by only a limited public; most popular works the autobiographical trilogy 'Ave', 'Salve', and 'Vale' entitled

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

'Hail and Farewell' work characterized E-288

Moore, Grace (born 1901), soprano, born Jellico, Tenn.; studied in U. S. and Europe; debut Metropolitan Opera, New York City, 1928; achieved great popularity in musical films (famous opera rôles, in 'La Bohème' and 'Louise').

Moore, James (died 1706), governor of Carolina; active in colonial politics and in Indian trade; became governor in 1700

besieges Fort Marion N-22

Moore, Sir John (1761-1809), British general, commander in Spain against Napoleon at Coruña; killed in moment of victory; buried in ramparts, as described in Wolfe's poem 'The Burial of Sir John Moore'.

Moore, John Bassett (born 1860), American jurist, born Smyrna, Del.; professor international law and diplomacy, Columbia University, 1891-1924, with frequent leaves of absence to serve on national and international commissions; judge Permanent Court of International Justice 1921-28.

Moore, Richard B. (1871-1931), American chemist, born Cincinnati; dean of science and head of chemistry department, Purdue University; chemist and metallurgist in government service; one of first workers in field of radioactivity; first to prepare radium in U.S.

Moore, Thomas (1779-1852), Irish poet and song writer, born Dublin; very popular in his day, especially for 'Lalla Rookh', an oriental verse romance; now best known for many lyrics set to music, such as 'The Last Rose of Summer' and 'Oft in the Still Night'; his life of Byron chief source of later biographies.

Moorhead, Minn., town on Red River, opposite Fargo, N. D.; pop. 9491; center of dairying, wheat- and potato-growing area; Concordia College; teachers college: map M-192

Moore's Creek, a small stream in North Carolina flowing into Cape Fear River; on its banks, about 20 mi. from Wilmington, a battle of the American Revolution was fought, Feb. 27, 1776, in which the Americans were victorious; made national military park 1926.

Moorfowl, or red grouse, the British grouse G-181

Moorish architecture, a form of Mohammedan architecture, *Outline* A-274-5

Algeria, pictures A-125

Alhambra A-127, picture S-233

fountain of the Grand Mosque, Algiers, picture A-240

Moorish idol, or sickle fish, handsome fish (*Zanclus cornutus*) found throughout the warm waters of the Pacific. The skin is a fine shagreen, the dorsal spines are prolonged, and the color is yellow crossed by bars of black; related to the angel fishes: color plate O-200c, d

Moorland, land made up of Moors. See in *Index* Moor

Moors, mixed Berber-Arabian race of n. Africa M-255

architecture. See in *Index* Moorish architecture

civilization M-216

Gaul F-171

Morocco M-260

Spain S-229-30, 228, M-255

Ximenes attempts to convert X-198

Moose, or elk M-257, E-256, picture M-256

names for young and females D-35

Moose, Loyal Order of, a secret, beneficiary, fraternal society, founded in 1888 at Louisville, Ky. Sick and funeral benefits are paid, and a home and vocational school for dependents and orphans of members is maintained at Mooseheart, near Aurora, Ill.

Moose elm E-256-7

Mooshead Lake, irregular lake near center of Maine, largest in state; 35 mi. long; 115 sq. mi.; outlet, Kennebec River: map M-38

Mooseheart Home and School, Mooseheart, Ill., founded by James John Davis. See in *Index* Moose, Loyal Order of

Moose Jaw, Saskatchewan, industrial, railroad, and grain distributing center 40 mi. w. of Regina; pop. 19,805; flour, lumber, packinghouse products; government stockyards: map C-50b

Moose River, Ontario, flowing into James Bay; 340 mi. long from head of main tributary, the Mattagami, to mouth; other tributaries are the Abitibi and the Missinaibi.

Moosewood. See in *Index* Striped maple

Moosonee, formerly Moose Factory, Ontario, railroad terminus and trading post of Hudson's Bay Company on James Bay at mouth of Moose River: map C-50c

Moplah, fanatical Mohammedan sect of Malabar district, India, numbering upwards of a million; believed to be descended from Arab immigrants; revolted 1921-22, killing hundreds of British and Hindus.

Moraceae (mō-rā'sē-ē). See in *Index* Mulberry family

Moradabad (mō-rā'dā-bād), or Muradabad, city and district in United Provinces, British India; city (pop. 110,000) has important brassware industry and contains a great mosque built in 1631: map A-332c

Moraea (mō-rē-ā), a genus of the Iris family I-130

Moraine (mō-rān'), a rock belt formed by a glacier G-96, I-2a, b

Moralities, or morality plays, allegorical plays of Middle Ages D-93-4

Moran (mō-rān'), Thomas (1857-1926), American etcher, illustrator, and landscape painter ('Grand Cañon of the Yellowstone').

Morand (mō-rān'), Paul (born 1888), French novelist; in diplomatic service in various parts of world; colorful cosmopolitan stories and travel books ('Open All Night'; 'Nothing but the Earth'; 'Black Magic'; 'Indian Air').

Morat (mō-rā'), town in w. Switzerland 15 mi. w. of Bern; pop. 2000; scene of battle (1476) in which the Swiss defeated Charles the Bold, Duke of Burgundy.

Moratin (mō-rā-tēn'), Leandro Fernández de (1760-1828), Spanish dramatist and poet; strongly influenced by Molière ('El sí de las niñas').

Moratorium, legal extension of time for payment of debts or obligation reparations and war debts H-335, 337, W-177, picture W-178

U. S. banks (1933) R-146e

Morava (mō-rā-vā) River, name of two rivers in cent. Europe. 1st (German, March) rises in Sudeten Mts. and flows s. 200 mi. through Moravia and Slovakia entering Danube at Bratislava: maps C-422, G-66, 2d, in cent. Yugoslavia, flows n. 100 mi. and enters Danube 30 mi. e. of Belgrade: map E-326e

Moravia (German Mähren), part of German protectorate of Bohemia and Moravia, annexed 1939; formerly a province of Austria-Hungary and later of Czechoslovakia: C-421, 422, maps A-381, C-422, G-66

racial character of people S-162

Moravian College and Theological Seminary, at Bethlehem, Pa.; founded 1807 by Moravian church; for men; arts and sciences.

Moravians, or United Brethren, Christian denomination which arose in Bohemia and Moravia among followers of John Huss; membership in U. S. about 36,600

missionary work C-234

settle in Georgia G-58

settle in Pennsylvania P-116

Wesley influenced by W-72

Moravská Ostrava (mō-rāf-skā ōs'trā-vā), German Mährisch-Ostrau (mē-rish ōs'trau), city in n. e. Moravia, in German protectorate of Bohemia and Moravia; pop. 175,000; coal mining; pig-iron production; metal manufactures: map C-422

Moray (mō-rā), Earl of. See in *Index* Murray, James Stuart, Earl of

Moray Firth, large bay on n.e. coast of Scotland; terminus of Caledonian Canal: maps E-279, 270a

Morays, great family of fierce eel-like fishes (*Muraenidae*), with strong bodies and dog-like mouths with highly developed teeth; found in all tropical seas; some are good food fish, but others poisonous; greatly feared by the native divers because of their ferociousness: E-192

Morchella esculenta (mōr-kē-lā ēs-kū-lēnt-ā), a mushroom, color plate M-306a-b

Mor'dant, a biting substance, particularly one used to fix dye or for purposes of etching

alum A-137

dyeing D-122

etching E-295

gum tragacanth and G-188

Mordecai (mōr'dē-kī), in Bible, cousin of Esther E-305-6

Mordkin (mōr'd'kēn), Mikhail, ballet dancer and choreographer, born Moscow, Russia; entered Moscow Imperial Ballet School at 9; danced with Pavlova and was also a member of Diaghileff's ballet: came to America 1922.

More, Hannah (1745-1833), English writer of verse and of plays and books on moral and religious subjects; later years devoted to philanthropy and encouragement of popular education ('Coelebs in Search of a Wife').

More, Paul Elmer (1864-1937), American author and editor; born St. Louis, Mo.; associate in Sanskrit and classical literature, Bryn Mawr College 1895-7; literary editor, *Independent* and the New York *Evening Post*; editor, *Nation* 1909-14 ('Shelburne Essays'; 'Nietzsche'; 'The Religion of Plato').

More, Sir Thomas (1478-1535), English statesman and scholar M-257-8

Morea (mō-rē-ā), modern name for s. Greece, the ancient Peloponnesus.

Moreau (mō-rō), Jean Victor Marie (1763-1813), French Revolutionary general; victor of Hohenlinden 1800; exiled for alleged conspiracy against Napoleon; joined Allies against Napoleon 1813; killed on battlefield of Dresden.

Moreau River, S. D., tributary of the Missouri, 200 mi. long: map S-218

Morel', an edible fungus M-307, color plate M-306a-b

Key—cāpe, āt, fār, fāst, whāṭ, fāll; mō, yēt, fērn, thēre; īce, bīt; rōw, wōn, fōr, nōt, dō; cūre, būt, rŷde, fŷll, būrn;

**Morelia** (*mō-rāl'yā*), Mexico, formerly Valladolid, city 130 mi. n.w. of Mexico City; cap. of Michoacán; named for patriot Morelos; pop. about 50,000; textiles, sugar, sweetmeats: *map* M-133  
university M-142b

**Morelos** (*mō-rāl'ōs*), José María (1765-1815), Mexican revolutionist; city of Morelia and state of Morelos named for: M-142d

**Morelos**, Mexico, state in s. center; 1916 sq. mi.; pop. 130,000; cap. Cuernavaca  
ejidos M-140

**Moreś** (*mō-rās'*), Antoine Amédée Marie Vincent Mauca de Vallombrosa, Marquis de (1855-96), French adventurer; farmed in North Dakota; explored in Tibet; killed in Africa by Tuaregs  
in North Dakota N-165

**Moresby**, L. *See* Beck, L. Adams  
"More sinned against than sinning"  
K-22

**Moresnet** (*mō-rā-nē'*), small territory 4 m. s.w. of Aachen, near Eupen and Malmedy; neutral territory 1815-1919; ceded to Belgium 1919; taken by Germany 1940.

**Morey**, Samuel (1762-1843), American inventor, born Hebron, Conn.; lived chiefly in Vermont; an early inventor of the steamboat; failure of his capitalist backers halted his enterprises and prevented his receiving the honors which later went to Robert Fulton.

**Morgan**, Charles Langbridge (born 1894), English novelist; served in 1st World War; became dramatic critic for *London Times*, 1921 ('The Fountain'; 'Sparkenbroke').

**Morgan**, Daniel (1736-1802), American Revolutionary general, born New Jersey; given command company of Virginia riflemen, 1775; distinguished himself in Arnold's expedition against Quebec, in both battles of Saratoga, and at Cowpens  
victory at Cowpens R-91

**Morgan**, Sir Henry (1635?-88), Welsh buccaneer; commissioned by the governor of Jamaica to take Spanish possessions, he ravaged the coast of Cuba and captured the city of Panama; was arrested and returned to England for fighting after peace had been arranged between Spain and England, but his immense stolen wealth gained his pardon; knighted and returned to Jamaica as lieutenant governor  
Panama City remains, *picture* P-41

**Morgan**, John Hunt (1836-64), American Confederate general, daring and famous cavalry raider  
raids Kentucky, Indiana, and Ohio C-255

**Morgan**, John Pierpont (1837-1913), American banker, financier, and art collector; leader in movement by which industry was stabilized and subordinated to finance; made J. P. Morgan & Co. one of world's most powerful banking houses, organized U. S. Steel Co., controlled many railroads: M-15

**Morgan**, John Pierpont (1867-1943), son of the preceding, succeeded to control of his father's banking business, which became incorporated state bank 1940; during 1st World War he was British government's commercial agent in U. S.

**Morgan**, John Tyler (1824-1907), U. S. senator from Alabama from 1877 to his death; enlisted 1861 in Confederate Army, brigadier general 1863; member of board 1892 to

arbitrate Bering fisheries dispute and of commission 1898 to codify Hawaiian laws.

**Morgan**, Lewis H. (1818-81), American archeologist and ethnologist ('League of the Iroquois'; 'Ancient Society'); bequeathed fund to found woman's college in University of Rochester.

**Morgan**, Thomas Hunt (born 1866), American zoölogist, born Lexington, Ky.; professor, Columbia University 1904-28; director of biological laboratories, California Institute of Technology; wrote books on embryology, evolution, and heredity; Nobel Prize in medicine, 1933.

**Morgan & Co.**, J. P., bank B-42

**Morganatic marriage**, marriage of a member of a royal family to a woman of lesser rank; not unusual in European court circles; neither wife nor children receive royal rank and title.

**Morgan horse**, a breed developed in New England for general utility and founded on the horse "Justin Morgan" H-343, 344

**Morganite**, a pink beryl used as a gem stone.

**Morgan le Fay**. *See in Index* Fata Morgana

**Morgan State College**, at Baltimore, Md.; founded 1867 by Methodist Episcopal church; for Negroes; arts and sciences.

**Morgantown**, W. Va., industrial city near n. boundary, on Monongahela River; pop. 16,655; coal, oil, glass-sand, and limestone near by; textiles, machine shop, wood, and glass products: *map* W-76  
state university, *picture* W-75

**Morgarten** (*mōr'gār-tēn*), hill in n. Switzerland, 18 mi. s. of Zurich, where Swiss mountaineers defeated Austrians (1315): *map* S-351  
battle S-351

**Mor'genthau**, Henry (born 1856), American diplomat, born Germany; ambassador to Turkey 1913-16; in charge of interests of Allies in Turkey during World War 1914-16; nominated ambassador to Mexico in 1920, but did not go on account of revolution.

**Morgenthau**, Henry, Jr. (born 1891), public official, publisher, born New York City; son of the above; publisher of *American Agriculturist* 1922-33; governor Farm Credit Administration 1933; appointed secretary of the treasury in President F. D. Roosevelt's cabinet 1934.

**Morghen** (*mōr'gēn*), Raffaello (1758-1833), Italian engraver; copied paintings by Leonardo da Vinci, Raphael, and other masters.

**Morgue**, name given to newspaper library N-109

**Morin** (*mō-rān'*), Paul (born 1889), Canadian poet ('Le Paon d'email'; 'Poèmes de cendre et d'or'); poems show oriental influence.

**Mo'rian**, name applied to black smoky quartz or cairngorm.

**Moris'cos** (little Moors), Mohammedans in Spain who accepted baptism, and their descendants M-255

**Morisot** (*mō-rō-sō'*), Berthe (Madame Eugène Manet) (1840-1895), painter, great-granddaughter of Fragonard and sister-in-law and pupil of Edouard Manet; her work has a distinctly "feminine touch."

**Morland**, George (1763-1804), English painter of animals and rustic scenes; many of his best paintings are familiar through engraved copies.

**Morley**, Christopher (Darlington) (born 1890), American writer, born Haverford, Pa.; charming informal essays ('Shandygaff'); verse, particularly in praise of domesticity ('Songs for a Little House'); novels in which fantasy, satire, and whimsical humor are variously blended ('Where the Blue Begins'; 'Thunder on the Left'); more realistic novels ('Human Being'; 'Kitty Foyle'); conductor of column 'The Bowling Green'.

**Morley**, Edward William (1838-1923), American chemist and writer on physics; born Newark, N. J.

**Michelson-Morley experiment** M-149

**Morley**, Thomas (1557-1603), English musician, one of greatest Elizabethan composers; organist at St. Paul's Cathedral; author of treatise on church music; composed madrigals, canzonets, ballets; wrote 'Plaine and Easie Introduction to Practical Musicke', which remained an authority for more than a century.

**Morley of Blackburn**, John Morley, Viscount (1838-1923), English statesman and man of letters, for 25 years a conspicuous Liberal in House of Commons; secretary for Ireland under Gladstone and for India under Campbell-Bannerman and Asquith; wrote lives of Gladstone, Burke, Cobden, Voltaire, Rousseau, his own 'Recollections'.

'Mormon, Book of' M-258

**Mormon cricket**, insect (*Anabrus simplex*) of the family Orthoptera; belongs to the shield-backed grasshopper group; body 1¼ in. long; color green, black, red, or brown; migrates in groups, invades cultivated areas of w. U. S. and does great damage; methods of control: poisoning by use of arsenical dust and trapping by means of pits and barriers. Also called western cricket.

**Mor'mons**, or Latter-Day Saints, religious body M-258-9

Arizona A-290

Edmunds Act A-313

Idaho I-10

irrigation works U-264, 266

Nevada N-78

temple, *picture* U-265

Utah U-264, 266; Salt Lake City

S-16, S-18

Wyoming W-196

**Mormon Trail**, early overland route to Salt Lake City T-126, F-16

'Morning', painting by Corot F-40, *picture* F-39

**Morning-glory** M-259, *picture* N-30

**Morning-glory family**. *See in Index* Convolvulaceae

**Morningside College**, at Sioux City, Iowa; Methodist; founded 1894; arts and science and music.

**Morning star**, name given to the planet Venus when it rises before the sun and is plainly seen in the sky just before dawn; sometimes applied also to other planets—Jupiter, Mars, Saturn, and Mercury.

"Morning star of song" C-158

"Morning star of the Reformation" W-191

**Morocco**, sultanate in n.w. Africa; about 165,000 sq. mi.; pop. about 7,130,000; divided into three zones: French, Spanish, and Tangier: M-259-60, *maps* A-127, A-42a, b. *See also in Index* French Morocco; Spanish Morocco; Tangier

Decatur conquers pirates D-23

Moors M-255

Tangier T-9

Morocco leather L-85, M-260



**Mo'ron**, a mentally deficient person M-118

**Moronidae** (*mō-rōn'i-dē*), family of fishes B-63

**Moros**, Malay race in Philippines P-166

**Morot** (*mō-rō'*), Aimé Nicolas (1850-1913), French historical and portrait painter; portraits of members of fashionable and artistic world of Paris. battle scenes 'Charge of the Cuirassiers', picture F-180

**Morpheus** (*mōr'fūs*), in Roman mythology, dream god, son of Somnus (sleep).

**Morphine**, a bitter crystalline narcotic alkaloid ( $C_{17}H_{19}NO_3$ ), the active drug in opium and dangerously habit forming poisoning, treatment for P-275

**Morpho cypris** (*mōr'fō sī'pris*), a South American butterfly, color plate I-87a-b

**Morphology**, the science dealing with the form and structure of living organisms A-191. See also in Index Anatomy, subhead comparative animal Z-227: Cuvier's contributions C-418

plant B-203, 205

**Morrice-dance**. See in Index Morris-dance

**Morrill, Justin Smith** (1810-98), American legislator, author of Morrill Acts A-54

**Morrill Acts** A-54, E-182, U-259

**Morris, Charles** (1784-1856), American naval officer who commanded the *Constitution* in battle with *Guerrière*; 1819 commander of South American squadron; later superintendent of Naval Academy.

**Morris, Clara** (1849-1925), American emotional actress (Camille, Alix, Lady Macbeth); after retiring from stage wrote about stage life; author of several novels and stories.

**Morris, Gouverneur** (1752-1816), American statesman, born New York; aristocrat by training and temperament, but ardent supporter of Revolution because he believed in its justice; as assistant to Robert Morris 1781-85 proposed decimal system of coinage and words *dollar* and *cent*; member of Constitutional Convention 1787, where he vigorously advocated a strong national government; much of later life spent abroad, two years as ambassador to France; U. S. senator from New York 1800-03; chairman of board 1810-16 which planned Erie Canal

Constitution revised by U-208

Department of Commerce U-226

**Morris, Gouverneur** (born 1876), American writer of novels and short stories; great-grandson of above, born New York City ('If You Touch Them They Vanish'; 'His Daughter'; 'Yellow Men and Gold').

**Morris, Lewis** (1726-98), signer of Declaration of Independence as New York delegate; born Morrisiana, N. Y.; brother of Gouverneur Morris, the statesman.

**Morris, Robert** (1734-1806), financier of the American Revolution M-260-1

charters brig *Nancy* W-105

**Morris, William** (1834-96), English poet, artist, and social reformer M-261

Trinity Church windows B-201

typography T-174, picture B-180: golden type, example B-177

**Morris-dance**, or **Morrice-dance**, old

English dance of Moorish origin; became part of all village festivities in reign of Henry VIII; usually danced by five men and a boy dressed as Maid Marian; gay costumes with bells; abolished by Puritans.

**Morrison, Robert** (1782-1834), English missionary to China C-221k

**Morrison, Mount**, Formosa (12,959 ft.), highest peak in Japanese Empire; also called Niitaka-yama.

**Morris Plan Bank**, a system of industrial banking founded by Arthur J. Morris in 1910; makes loans at reasonable rates of interest to responsible people of low income.

**Morristown, N. J.**, residential town 17 mi. n.w. of Newark in rich farming district; pop. 15,270; State Insane Hospital 4 mi. away; shaft for first steamship to cross Atlantic was cast here, and Morse and Vail worked on electric telegraph; Washington's winter quarters (1776-77)

national historical park N-22b

**Mor'ro Castle**, fort at entrance to harbor of Havana, Cuba; built in late 16th century by Spanish colonists as a protection against French, English, and Dutch buccaneers; also used as a prison; guns last fired during Spanish-American War; now a popular tourist sight.

**Morro Velho**, a Brazilian gold mine, noted for its depth (6126 feet).

**Morrow, Dwight Whitney** (1873-1931), American diplomat and statesman, born Huntington, W. Va.; practised law in New York; member J. P. Morgan & Co.; resigned 1927 to accept appointment as ambassador to Mexico; elected U. S. senator from New Jersey 1931. His daughter Anne married Charles A. Lindbergh

Mexican friendship won M-142f, L-67

**Morrow, Elizabeth Reeve Cutter** (born 1873), American author, born Cleveland, Ohio; married Dwight Whitney Morrow; acting president of Smith College 1939-40; author of 'Painted Pig', 'Beast, Bird and Fish', 'Quatrains for My Daughter'.

**Morrow, Honoré Willis** (McCue) (1880-1940), American writer, born Ottumwa, Iowa; editor of *Delinquent* 1914-19; known especially for historical novels ('Forever Free', 'With Malice Toward None', 'The Last Full Measure'-trilogy on Lincoln; 'Still Jim'; 'On to Oregon').

**Mors**, in Roman mythology, god of death, corresponding to Greek Thanatos.

**Morse, Samuel Finley Breese** (1791-1872), American artist and inventor of the electric telegraph M-261-2, picture I-115

telegraph invented by M-262, T-30, 32

wireless signals R-26

**Morse code**, in telegraphy T-30

wigwag signaling S-143

**Mortality**. See in Index Vital statistics

**Mor'tar**, in masonry C-128, L-138

**Mortar**, short cannon firing at high angles A-319. See also in Index Trench mortar

**Mortara** (*mōr-tā'rā*), town in n. Italy 25 mi. s.w. of Milan; pop. 10,000; makes cheese and hats; Austrians defeated Sardinians 1849.

**'Morte d' Arthur'** (*mōrt dār-tūr*), greatest collection of Arthurian romances; translated and compiled by Malory; first printed by Caxton in 1485: A-316

**Mortgage** (*mōr'gāj*), a lien upon property or conveyance of property

as security for payment of a debt, becoming void when the debt is discharged: C-394, 392

bank investments B-39

farm loans F-12: Serbian law S-81

federal lending agencies U-228

insurance companies' holdings I-96

second or junior lien S-291

security for bank loans B-39

security for bonds S-291

**Mort Homme** (*mōr tōm*) (Dead Man's Hill), key to Verdun in 1st World War V-283

**Mortimer, Roger** (1287-1330), first earl of March; an adherent of Edward II; later his enemy: E-189

**Mortimer's Cross**, battle in Wars of Roses 1461, in w. England, 40 mi. s.w. of Birmingham; Edward, Duke of York, defeated Lancastrians.

**Morton, John** (1724-77), signer of Declaration of Independence; born Ridley, Pa.

**Morton, J(ulius) Sterling** (1832-1902), American journalist; U. S. secretary of agriculture 1893-97; estate in Nebraska City is a state park originates Arbor Day A-247

**Morton, Levi Parsons** (1824-1920), American banker, born Shoreham, Vt.; minister to France 1881-85; governor of New York 1895-97

vice-president of U. S., table V-392

**Morton, Oliver Perry** (1823-77), American statesman, born Salisbury, Ind.; governor of Indiana 1861-67, and perhaps greatest of all war governors; U. S. senator 1867-77.

**Morton, Thomas** (1590?-1646), English adventurer, a Royalist rake who amused himself at expense of the "precise Separatists that lived at New Plymouth"; set up a Maypole, and sold rum and guns to the Indians at Merry Mount, now Quincy, Mass.

**Morton, William T. G.** (1819-68), American dentist, born Worcester County, Mass.; important work in discovery and practical use of surgical anesthesia: A-196, picture I-115

**Mosaic** (*mō-zā'iks*) M-262

Byzantine P-15

early Christian P-14

Roman Sun God, picture A-252

St. Mark's I-172

Santa Sophia wall, picture A-265

**Mosaic disease**, a highly infectious virus disease affecting many plants including cucumber, potato, tomato, bean, and turnip; causes dwarfed growth and mottled (mosaic) and distorted leaves: P-245c-d

spread by insects I-90

**Mosaic gold** C-177

**Mosaic law**, ancient law of the Hebrews, first laid down by Moses M-265

punishment under P-348

**Mosander** (*mō-sān'dēr*), Carl Gustav (1797-1858), Swedish chemist and mineralogist, discoverer of lanthanum, erbium, and terbium.

**Mosby** (*mōz'bi*), John Singleton (1833-1916), Confederate soldier, guerrilla raider, and commander of independent cavalry body called Mosby's Rangers; particularly active in Virginia and Maryland 1863-64; said to have originated phrase "the solid South."

**Moscheles** (*mōsh'ē-lēs*), Felix (1833-1918), English portrait painter (Grover Cleveland, Browning, Gounod, Henry M. Stanley, and other famous men); intimate friend of Whistler, Du Maurier, and literary and artistic men of his time; son of Ignaz Moscheles.

Moscheles, Ignaz (1794-1870), Austrian pianist and composer, born Prague; teacher and friend of Mendelssohn.

Moschus (*mōs'kūs*) (2d century B.C.), Greek pastoral poet ('Europa').

Mościcki (*mōsht-sēt'skē*), Ignacy (born 1867), Polish chemist; 3d president of Poland, 1926-39; removed to Switzerland 1939.

Moscow (*mōs'kō*), Idaho, town 65 mi. s.e. of Spokane, Wash.; pop. 6014; flour, lumber, clay products; stock raising; center of pea industry; University of Idaho: map I-8

Moscow, Russia, also Moskva, cap. and largest city of Russia; pop. over 4,135,000: M-262, 264-5, map E-326c

apartment houses, picture R-191

climate R-180

czar bell B-93, pictures B-93, M-264

fire (1752) F-58

Kremlin M-264, pictures M-263, 264, R-187, 189

Lenin library L-106, picture L-106a

Lenin's tomb M-264, pictures M-263, R-191

Napoleon's occupation N-10

Red Square, picture M-263

St Basil, picture M-263

Moscow Conference, 2d World War W-179g-h, R-146r

Moscow-Volga Canal V-334, table C-433

Moseley, Edward, North Carolina leader N-159

Moseley, Henry Gwyn-Jeffreys (1887-1915), English physicist; gave his name to the Moseley number, an alternative name for atomic number: A-362

X-ray spectra discoveries X-200, S-244

Moselle (*mō-zēl'*), department of Lorraine; area, 2404 sq. mi.: A-137

Moselle River (German Mosel), in n.e. France and s. Germany; flows 320 mi. n.e. to Rhine at Coblenz; valley noted for vineyards: R-93, map G-66

Cochern Castle, picture G-74

Moses, Hebrew leader and lawgiver M-265, J-216, pictures J-215, M-265

statue by Michelangelo M-148, picture M-146

Moses ben Ma'mon, or Maimonides (1135-1204), Jewish philosopher H-267

Moskva, Russia. See in Index Moscow

Moslems, name applied to themselves by the followers of Mohammed. See in Index Mohammedanism

Mosley, Sir Oswald (born 1896), English politician; member of Parliament as Conservative, later as Labor; 1931 headed the "New party" (Fascist), which was defeated in elections; imprisoned 1941, released Dec. 1943 because of illness.

Mosque (*mōsk*), a Mohammedan temple of worship

Azhar, Cairo, picture C-17

Banya-Bashi, Sofia, picture B-270

fountain of Grand Mosque, Algiers, picture A-240

Great Mosque, Mecca M-103, picture M-102

Kabul, Afghanistan, picture A-30

Kadhimain, Baghdad, picture I-123

minarets, pictures M-214, I-123

Omar, or Dome of the Rock J-211, picture A-329

Santa Sophia, pictures A-261, T-161

Shah Jehan, Delhi, picture D-43

Sultan Achmet, Istanbul, pictures T-163, A-262

Mosquito (*mōs-kē'tō*) M-266-70

Arctic regions A-278

breeding habits M-266

carrier of disease M-266-70

control methods M-270

eggs M-266, picture M-267

malaria carrier, conquest M-266-70

natural enemies M-270: dragon fly D-88, 90; newt S-13

"song," how produced M-268

yellow fever carrier, conquest M-270, S-42-3: Panama P-46; Gorgas' work G-122

Mosquito Coast, or Mosquitia, strip of land occupied by Mosquito Indians on e. coast of Central America; British protectorate until 1860; now part of Nicaragua; long source of diplomatic disputes between Great Britain and U. S.: C-133d

"Mosquito fleet," in naval warfare M-291, N-56

Mosquito netting, or mosquito bar, a coarse, stiff, cotton net, plain or barred; used, especially in South, as canopy for beds and baby carriages; also for window screening.

Moss, a small, leafy-stemmed, flowerless plant, of the phylum Bryophyta M-270-2

Moss, club, a low-growing, evergreen plant related to fern; often bearing club-like cones of sporangia F-26

Moss, Iceland, a lichen L-122

Moss, Irish, or carrageen, a seaweed, source of vegetable gelatin S-73, picture S-72

Moss, reindeer, a lichen most abundant in arctic and subarctic regions; large starch content: L-122

Moss, Spanish, or Florida moss, an air plant A-95, pictures G-59, F-113

uses L-206

Moss agate G-28

Moss animals, the Bryozoa W-180b

Moss campion. See in Index Silene

Moss locust, or rose locust, American species of locust tree L-179

Moss pink, a phlox P-173

Moss rose (*rosa centifolia*), a variety of rose having a hairy calyx and stem, white and pale pink flowers, and gray-green leaves.

Moss stonecrop. See in Index Stonecrop

Mostaganem (*mōs-tā-gā-nēm'*), Algeria, city on n. coast 48 mi. e. of Oran; pop. 37,000: map A-42a

Mostar (*mōs-tār'*), Yugoslavia, city 46 mi. s.w. of Sarajevo; pop. 16,000 (Turco-Italian); former cap. Herzegovina; fine Roman bridge: picture B-19

Most Favored Nation Clause, a treaty provision between nations I-110d, T-13a

Mosul (*mō-sul'*), city in Iraq (Mesopotamia) on Tigris River 220 mi. n.w. of Baghdad; pop. about 100,000; caravan trade: maps A-242, A-332b

cotton manufactures C-379

declared part of Iraq I-123

ruins of Nineveh N-146

Moszkowski (*mōsh-kōf'skē*), Moritz (1854-1925), composer and pianist, born Breslau, Germany, of Polish parents; works include an opera ('Boabdil'), a symphonic poem ('Jeanne d'Arc'), and exquisitely beautiful pieces for piano ('Spanish Dances').

Motacillidae, a family of perching birds embracing the wagtails and pipits B-132

Motet, sacred musical composition for several voices without instrumental accompaniment; important in 16th century; usually with Latin but later sometimes with French, German or Italian text.

Moth, an insect of the order Lepidoptera, with feathery antennae; usually nocturnal in habits: B-282-6,

color plates B-285a-b, I-130a-b.

See also in Index Caterpillar

antennae B-284, picture B-285

caterpillar stage C-98-100

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kinds B-286, color plate B-285a-b

army worm A-308-9

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cecropia, picture B-282, color plate I-130a-b

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codlin C-294

corn borer I-89, picture I-93

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Mother Shipton, reputed prophetess, supposedly lived in England in 16th century; purported collections of her prophecies appeared later.

Mothers' pensions P-118, P-161

Motherwell, William (1797-1835), Scottish poet, born Glasgow; 'Jeanie Morrison' and 'The Cavalier's Song' among best known poems; made famous collection of ballads.

Moth miller, miller, or owl-moth, moth of the cutworm C-418

Motif, in music, a distinguishing musical phrase which usually recurs frequently in a composition.

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ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

# Fact-Index

## A LIST OF COMMON MOTION-PICTURE TERMS

**Animation.** Process of making animated cartoons, apparent motion of inanimate objects, and the like.

**Breakaway.** A bottle, club, or other object, made of wax or some light material, which breaks when the victim is struck. Breakaway furniture is commonly made of yucca wood.

**Chemical fade.** Chemical treatment of negative to give a fade-in or fade-out effect.

**Cutter.** One who "cuts," or edits a film, putting it into proper sequence.

**Dissolve.** The melting of one scene into another, or the merging of one image, such as a young actor dissolving into an older person. Also called "lap dissolve." The camera must be reversed to bring the film to the start of the fade out, or a little before this point, and then "faded in" on the new subject.

**Double.** An actor who takes the place of a star in a hazardous bit of action. Sometimes means a double exposure.

**Double exposure.** The photographing of two separate images on one film.

**Dub in.** To record sound effects to be used with a film which was originally photographed without sound.

**Dupe negative.** A negative film, secured by printing from a positive. News reels are printed from several "dupes," in order to gain speed in distribution.

**Exchange.** A distributing office, where films are rented to the theaters, inspected, and put in condition after showing. Big film companies have exchanges in all principal cities.

**Fade.** A gradual darkening or lightening of the whole scene. Accomplished in professional cameras by the shutter, which closes or opens a slight bit over the preceding exposure, thus gradually and progressively decreasing or increasing the exposure.

**Fade in.** To start with a black screen and build up the picture to full brilliance.

**Fade out.** To reverse the preceding effect.

**Flicker.** The intermittent fluttering of light and dark on the screen. May be due to slow speed of the projecting machine, or faulty adjustment. Modern projectors do not flicker at normal speed.

**Follow focus.** To adjust the focus of the camera lens as the subject moves nearer to or farther away from the camera, during the filming of a scene.

**Frame.** One picture of a motion-picture film. For silent pictures the frame is an inch wide and three-fourths of an inch high, and there are 16 frames to the foot of film.

**Gate.** The part of the film track where the film is exposed; or the corresponding place in the projector where the picture is projected to the screen.

**Gauze shot.** A scene photographed through fine gauze. This gives a soft effect, yet the picture is in sharp focus.

**Ghost (lens).** A patch of light, somewhat like a flare, due either to internal reflections within the lens, or to strong external light striking into one side of the lens.

**Ghost (figure).** A phantom-like effect secured by double exposure.

**Hard lighting.** Use of undiffused light to create a certain mood in the lighting of a set. An example is the prowling of a burglar, where the effect is wanted of weird lighting and shadows.

**Iris.** A diaphragm similar to the iris diaphragm within the lens, but much larger, and used in front of the lens. Closing down the aperture gives the effect of the picture closing down to a point of light, which then disappears.

**Kinema.** English form for Cinema. Motion pictures, or a motion-picture theater.

**Master negative.** The final arrangement of the negative. From this will be printed the positive prints for distribution throughout the country, and also from one of these positives may be printed a number of dupe negatives.

**Mixer.** In talking-picture work, an operator responsible for securing proper relation between sounds in making records.

**Mixing panel.** The electrical equipment for effecting the above result.

**Monitor.** An operator who listens to all sounds being recorded, to assure proper balance and effect desired.

**Multiple exposure.** More than three exposures on one frame or series of frames.

**"Non-flam."** Non-burning, or "safety-film"; all home movies are on film of this type.

**Pan.** To swing the camera slowly about to follow a moving action. Abbreviation for "panorama."

**Pan film.** Panchromatic film, sensitive to red and yellow light.

**Parallel.** An adjustable platform about five feet square, which is used as a portable base for cameras, where it is necessary to have the camera elevated.

**Playback.** The playing of a previously made sound track, including the music and other sound effects, while the action in a film is being photographed. Action is carefully synchronized with the playback. Used especially in scenes in which there are large numbers of people or in outdoor sets.

**Positive.** The film printed from the negative and used in the actual projection.

**Process shot.** Live action photographed against background on which previously photographed scene is projected. Thus a studio scene may be made to appear as if it had been enacted in a distant place or under dangerous circumstances.

**Prop.** Contraction of "property"; any object which is used in the action of a story or play. Not to be confused with the furnishings of a set, which are not handled by the actors.

**"Props."** The property man. Responsible for procuring the props necessary to the action. Must see that they are in place for the scene being taken.

**Reel.** Special spool on which film is wound. The standard reel holds 1000 feet of film; but others hold 2000 or more feet.

**Release.** The finished picture, available for rental, on and after a certain date, the "release date."

**Reverse motion.** Comedy effects secured by means of running the camera backward, or turning it upside down.

**Running shot.** A scene secured with the camera on a platform on the front of a locomotive, or car, or other vehicle. Used to show action taking place while the subject moves along, as in driving a car.

**Rush.** The scenes photographed each day are hurriedly printed, and then projected for the director and his staff to see.

**Script.** The director's working scenario. Contains all directions and changes made in the original scenario.

**Script clerk.** Usually a young woman, responsible for noting all items bearing on action, costumes worn, etc.

**Sequence.** A series of scenes which tie together in a more or less logical order.

**Set.** A representation of a room or any other place in which action takes place. May be indoors, or otherwise.

**Slow motion.** The grotesque and interesting effect in which the action is very slow. Secured by running the camera many times normal speed, usually eight times faster than normal. Projected at normal speed, the action is thus slowed down.

**Soft focus.** Secured by means of a special lens or diffusion disk before the lens. Much used in scenic effects or special close-ups.

**Splice.** The joint where two pieces of film are joined.

**Spot.** A powerful spotlight used to accentuate some portion of a scene, or to backlight a subject.

**Static.** Marks on film produced by electrical discharges which streak and otherwise deface the picture.

**Still.** A picture taken with an ordinary camera, usually for advertising purposes.

**Stop motion.** The method by which animated effects are secured. A special shaft on the camera allows one frame to be exposed for each turn of the crank. Between each exposure the object being animated is moved slightly.

**Synchronism.** The proper running of cameras and sound recording machines, so that the sound shall occur at the right moment when the picture is projected.

**Take.** As each scene is photographed, perhaps over and over until action and sound are correct, it is given a number. Each of these attempts at a perfect scene is called a "take."

**Tinting.** Tinting or dyeing the film to secure a color effect. Largely replaced by film having colored celluloid base.

**Toning.** Chemical treatment of film emulsion to make the dark portions blue, brown, red, or other shades, without affecting the high lights (the clear portions).

**Truck up.** The camera, mounted on a platform with rubber-tired wheels or on a portable crane is moved about during the taking of a scene.

**Ultra-speed.** The cameras for making slow-motion films are usually fitted with special shuttle movements allowing extremely rapid movement.



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television T-41-2  
three-dimension film M-280

**Motions**, in parliamentary law P-80-1

**Motley, Archibald J.** (born 1891), American Negro painter, born New Orleans, La.; outstanding for colorful and vital paintings representing various aspects of Negro life.

**Motley, John Lothrop** (1814-77), American historian, born Dorchester (now part of Boston), Mass.; minister to Austria 1861-67 and to England 1869-70; wrote two novels, but is best known for his vivid and scholarly histories of the Netherlands ('The Rise of the Dutch Republic'; 'The United Netherlands'; 'Life and Death of John Barneveld'): A-179

**Motmot** (*mōt'mōt*), a tropical American bird (of family *Momotidae*), about the size of a blue jay with brilliant blue and green plumage. The middle feathers of its tail are longer than the others and have a peculiar racket shape, due to the fact that some of the barbs break off, leaving part of the quill bare.

**Moton, Robert Russa** (1867-1940), Negro educator, born Amelia County, Va.; instructor Hampton Institute (1890-1916); succeeded Booker T. Washington as president Tuskegee Institute 1915, retired 1935 ('Racial Good Will'; 'Finding a Way Out', autobiography; 'What the Negro Thinks').

**Motor**, a machine supplying mechanical power. *See also in Index* Diesel engine; Electric motor; Gas engine; Steam engine  
airplane A-74b-d, 84-5; radial, air-cooled A-84-5, *pictures* V-314, A-85; Diesel A-85, *picture* G-20; instruments A-76-8, *picture* A-77  
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**Motorized division**, U.S. Army A-307c

**Motor nerves** N-65

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**Motor ship** S-124  
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**Mott, J. L.**, iron bridge builder, *picture* I-115

**Mott, John R.** (born 1865), writer, lecturer, and Y. M. C. A. leader, general secretary of international committee and of national council; born Livingston Manor, N. Y.

**Mott, Lucretia** (1793-1880), American Quaker reformer, abolitionist, and women's rights advocate, born Nantucket, Mass. W-132

**Motta, José Vianna da**. *See in Index* Vianna da Motta, José

**Motte** (*mōt*), Rebecca Brewton (1739-1815), South Carolina Revolutionary War heroine S-216

**Mottl** (*mōt'l*), Felix (1856-1911), German musical conductor and composer, born near Vienna; gifted conductor of Wagner's music at Bayreuth and other cities; general music director, Munich; wrote 'Agnes Bernauer' and other operas.

**Mottram, Ralph Hale** (born 1883), English author; writer of war stories and other historical novels ('Spanish Farm', trilogy; 'Ten Years Ago'; 'The Boroughmonger').

**Mouflon** (*mōf'lōn*), a wild sheep S-104

**Mould**. *See in Index* Mold

**Moulmein** (*mōl-mān'*), city in lower Burma on Gulf of Martaban; pop. about 65,000; trade in teak and rice: B-279, *map* A-332c

**Moulton, (Ellen) Louise Chandler** (1835-1908), American story-writer and poet, born Pomfret, Conn. ('Bedtime Stories' and other books for children; 'In the Garden of Dreams' and other poems).

**Moulton, Forest Ray** (born 1872), American astronomer, born Le Roy, Mich.; University of Chicago 1898-1927; research associate Carnegie Institution 1908-23 ('Celestial Mechanics'; 'Astronomy'; 'Consider the Heavens')  
planetesimal theory P-233, E-128

**Moultrie** (*mōl'trī*), William (1731-1805), American general in Revolutionary War, born Charleston, S. C.; built fort on Sullivan's Island to protect Charleston (later named Fort Moultrie), where he repelled a fierce British attack in 1776; held prisoner by British 1780-82; later governor of South Carolina  
flag devised by F-98, *color plate* F-90  
repulses British attack S-216

**Moultrie, Ga.**, city in s. w. of state, 37 mi. n. of Florida border; pop. 10,147; meat packing and watermelon shipping; named for Gen. William Moultrie.

**Mound birds**, or megapodes, family of

Australian birds that do not brood their eggs E-192

**Mound builders** prehistoric American Indians M-291, A-147  
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**Mound-building ant** A-213

**Mound-building termite** T-52a-b

**Mound City Group**, national monument in Ohio N-22b

**Mounds**, in archeology A-251

**Moundsville, W. Va.**, commercial city 11 mi. s. of Wheeling, with farming and coal interests; pop. 14,168; glass, enameled ware, bricks, toys; zinc smelter; state penitentiary; named from relics of mound-builders discovered there: *map* W-76

**Mounet-Sully** (*mō-né' sū-lē'*), Jean (1841-1916), French actor; commanding presence and passionate vigor of his acting were strikingly suited to variety of tragic and romantic parts (Oedipus, Hamlet, Hernani, Ruy Blas).

**Mount**. *See in Index* under specific names, as McKinley, Mount

**"Mountain,"** French party during Revolution F-204

**Mountain ash** M-291

**Mountain beaver**, a rodent of the family *Aplodontiidae*, native only to the Pacific coast of North America; about 14 in. long, with a blunt head, small eyes and ears, and very short tail; lives in burrows in moist woods; not a true beaver; also called boomer, whistler.

**Mountain bluebird**, or Arctic bluebird B-159

**Mountain cranberry**. *See in Index* Lingonberry

**Mountaineers**, or mountain whites, inhabitants of a mountain region; specifically, in U.S., natives of mountain regions of s. U.S.

**Great Smoky Mountains** G-151  
Kentucky K-13  
Virginia V-308

**Mountain goats**, or goat-antelopes, animals intermediate between goats and antelopes; term often applied to any wild goat, such as ibex, living in mountains

**Rocky Mountain goat** R-122, A-218, *picture* A-219

**Mountain hare** H-223

**Mountain laurel** L-72, *picture* L-72

**Mountain lion**, cougar, or puma P-365-6  
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**Mountains of the Moon.** See in Index Moon, Mountains of the

**Mountain spurge.** See in Index Pachysandra

**Mountain States,** name used by U. S. government for geographic division including states of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada.

**Mountain time** T-94, diagram T-95, map U-198b

**Mount Allison University,** at Sackville, New Brunswick, Canada; Methodist in origin but now non-sectarian; founded 1862 (academy 1842); arts and science, music, theology, engineering; affiliated with McGill University in engineering.

**Mount Angel College and Seminary,** at St. Benedict, Ore.; Roman Catholic institution, founded 1887; arts and sciences, theology.

**"Mount Ball,"** game P-252

**Mountbatten** (*mount-bät'en*), Louis, Lord (born 1900), cousin of King George VI of England; served in Royal Navy in 1st World War; chief of combined operations and head of commandos 1942-43; appointed United Nations' commander in southeast Asia Aug. 1943.

**Mount Carmel, Pa.,** borough in anthracite region, 45 mi. n.e. of Harrisburg; pop. 17,780; textiles, cigars, iron goods; model fruit farm.

**Mount Clemens, Mich.,** city, summer resort on Clinton River 21 mi. n.e. of Detroit in farming section; pop. 14,389; pottery; Selfridge Field, U. S. Army air field, 3 mi. east; medicinal springs: map M-153

**Mount Desert Island,** off coast of Maine; 100 sq. mi.: M-39, map M-38  
 Acadia National Park N-19

**Mounted police.** See also in Index Police

**Royal Canadian P-288,** picture P-287  
 Texas rangers T-60, P-288, picture P-287

**Mount Holyoke College,** at South Hadley, Mass.; for women; non-sectarian; chartered 1836 (opened 1837) as seminary, college since 1888; collegiate work; art and archeology, Biblical history and literature, economics, education, English, history, languages, mathematics, music, philosophy and psychology, sciences.

**Mount Hope Bay Bridge,** in Rhode Island, table B-342

**Mount McKinley National Park,** Alaska N-22b-c, M-13, map A-105, picture A-104

**Mount Mary College,** at Milwaukee, Wis.; Roman Catholic, for women; founded 1915; arts and sciences.

**Mount Mercy College,** at Pittsburgh, Pa.; Roman Catholic, for women; founded 1929; arts and sciences.

**Mount Olympus National Monument,** Washington, in Olympic Mts., near w. coast N-22c

**Mount Pleasant, Iowa,** city 65 mi. s.w. of Davenport in farm section; pop. 4610; Iowa Wesleyan College; state insane asylum.

**Mount Rainier** (*rä'nēr*) National Park, Washington, in Cascade Mts., 60 mi. s.e. of Seattle; 377 sq. mi.: W-29, S-71a, N-22c, map W-29, pictures W-28, N-15, S-71a

**Mount Revelstoke National Park,** a Canadian park in s. British Columbia; winter sports, wild life: N-23

**Mount Rushmore, S. D.,** in Black Hills near Rapid City; carved as memorial: S-217, picture S-220

**Mount St. Joseph, College of,** at Mount St. Joseph, Ohio; Roman Catholic institution for women, founded 1852; arts and sciences.

**Mount Saint Mary's College,** at Emmitsburg, Md.; for men; Catholic; founded 1808; arts, science, education, and business administration.

**Mount St. Mary's College,** at Los Angeles, Calif.; Roman Catholic institution for women, founded 1925; arts and sciences.

**Mount St. Scholastica College,** at Atchison, Kan.; Roman Catholic institution for women, founded 1863; arts and sciences.

**Mount St. Vincent, College of,** at New York City; Roman Catholic institution for women, founded 1910; arts and sciences.

### HIGHEST MOUNTAINS IN VARIOUS COUNTRIES

	HEIGHT IN FEET
Aconcagua, Argentina (highest in South America).....	22,834
Mont Blanc, France (highest in Alps).....	15,782
Elbrus, Russia (highest in Europe).....	18,465
Etna, Sicily.....	10,750
Everest, Nepal (highest in world).....	29,141
Fujiyama, Japan.....	12,500
Godwin-Austen, India (2d highest in world).....	28,250
Kilimanjaro, Africa (high- est in Africa).....	19,710
Kosciusko, Australia (high- est in Australia).....	7,328
Logan, Canada (highest in Canada).....	19,850
McKinley, Alaska (highest in North America).....	20,300
Mauna Kea, Hawaiian Islands.....	13,784
Mitchell, N. C. (highest in eastern U. S.).....	6,684
Orizaba, Mexico (highest in Mexico).....	18,700
Mount Thorvald Nilsen (highest in Antarctica).....	15,400
Washington, N. H. (highest in northeastern U. S.).....	6,288
Whitney, Calif. (highest in continental U. S.).....	14,495

**Mountstephen, George Stephen, Baron** (1829-1921), Canadian financier, with Lord Strathcona responsible for completion of the Canadian Pacific Railroad.

**Mount Union College,** at Alliance, Ohio; founded 1846; liberal arts, music.

**Mount Vernon, Ill.,** city 72 mi. s.e. of St. Louis in agricultural section; pop. 14,724; steel cars, shoes, knit goods, furnaces, canned goods.

**Mount Vernon, Iowa,** town 15 mi. s.e. of Cedar Rapids; pop. 1489; Cornell College.

**Mount Vernon, N. Y.,** residential and manufacturing suburb near New York City on Bronx River and several railroads; pop. 67,362; chemicals, clothing, mirrors: map N-114

**Mount Vernon, Ohio,** city 46 mi. n.e. of Columbus; pop. 10,122; glassware, bridge parts, engines; birthplace of Daniel Decatur Emmett, composer of 'Dixie'.

**Mount Vernon, Va.,** George Washington's home M-292-3, W-17, 12

official portrait of Washington, picture W-21  
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 Washington buried W-20

**Mount Vernon Parkway** N-22c

**Mount Wilson Observatory,** Pasadena, Calif. G-105, pictures O-194, T-39, 40

**Mourning bride.** See in Index Scabiosa

**Mourning cloak butterfly,** or Vanessa antiope B-284, color plate N-38a-b

**Mourning dove,** wild N. American dove of the genus *Zenaidura*; named for its plaintive cry; sometimes called turtle dove: pictures N-33, color plate B-135  
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**Mouse,** a rodent M-293  
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**Mouse deer.** See in Index Chevrotain

**Mousefish.** See in Index Sargassum fish

**Mouse River,** in North Dakota, and Canada. See in Index Souris River

**Mouse Tower** (*Mäuseturm*), tower on rock in Rhine River near Bingen: R-93, picture G-71

**Mouse weasel** W-59

**Mousseline de soie** (*mōs-lēn' dū swā*) (silk muslin), a delicate silk fabric, somewhat heavier than chiffon, often figured.

**Moussorgsky** (*mō'sōrg'skē*), or Musorgski, Modest Petrovitch (1835-81), Russian composer; although he had little training (practising music as amateur while working as government clerk), he has come to be recognized as one of the greatest Russian composers of songs and music drama; closely associated with Rimsky-Korsakof and Balakiref; best known by opera 'Boris Gudonof'

**Mouth,** entrance to alimentary canal of animals  
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**Mouth organ,** harmonica, or French-harp, musical instrument H-224-5

**Movement,** in physiology B-110

**Movement,** in symphonies M-312-13

**Moving pictures.** See in Index Motion pictures

**Moving stairway,** or escalator E-250

**Mo'wat, Sir Oliver** (1820-1903), Canadian statesman, leader in movement for Confederation; premier of Ontario 1872-96; lieutenant governor of Ontario after 1897; a Liberal leader who was a strong supporter of provincial rights as against the Dominion Parliament

**Mowgli** (*mōu'gli*), in Kipling's 'Jungle Book' an Indian boy who is adopted by wolves and becomes their leader: K-24, picture K-24a

**Moyen Congo.** See in Index Middle Congo

**Moylan, Stephen** (1737-1811), Revolutionary soldier, born Cork, Ireland; served with distinction at battle of Princeton, and with Pu-

laski and Lafayette's armies; became brigadier general 1783.

Mozambique (*mô-zâm-bêk'*), or Portuguese East Africa, a colony of Portugal on s.e. coast of Africa; 298,000 sq. mi.; pop. 4,000,000; cap. Lourenço Marques: M-294, E-138, 140, *maps* E-139, A-42a, b, S-202

Mozambique, Portuguese Mozambique, town in province of Mozambique, formerly the capital; pop. 7000: M-294, *maps* A-42a, E-139

Mozambique Channel, strait in Indian Ocean between Madagascar and e. coast of Africa: *maps* A-42a, b, E-139

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'Mrs. Wiggs of the Cabbage Patch', novel by Alice Hegan Rice featuring the philosophical Mrs. Wiggs, who shows that life has its good points even in the very poor district of a small Kentucky town.

MTB's, boats M-291

Mucha (*mq'kü*), Alfons (1860-1939), painter, born in Moravia; lived for some time in Paris; large historical scenes and smaller decorative paintings in delicate colors ('The Epic of Slavic History', series of 20 large paintings in Prague).

'Much Ado About Nothing', one of Shakespeare's comedies, involving Hero and Claudio, lovers, deceived by Don John, and Beatrice and Benedick, battling wits, who also fall in love; Dogberry and Verges, stupid policemen, add humor chronology and rank S-100e

Mucilage, adhesive made of gum dissolved in water G-188, *chart* C-366b

Muck (*muk*), Karl (1859-1940), German musical conductor; studied at Leipzig Conservatory; established as chief conductor, Berlin opera, 1892; conducted Bayreuth Festivals for many years; conductor Boston Symphony, 1906-8, 1912-18, Hamburg Philharmonic, 1922-33.

Muck, soil S-191d

Mucous membrane, a membrane that secretes mucus and lines passages of the body that communicate with the external air: P-206

Mud-dauber, a wasp W-34

classified W-35

Mudfish, or lungfish M-295-7

Mud-hen, or coot, a water bird C-356, R-35, *picture* R-35

Mud huts, in Turkish village, *picture* A-326

Mudjekce'wis, or West Wind, in Longfellow's poem 'Hiawatha' L-194

Mud-minnow, a mudfish M-297

Mud puppy, a newt S-12

Mud-skipper, or goby, East Indian fish M-296, 297

Mudstone, a soft structureless clay rock S-158

Mud turtle, a fresh-water turtle T-167, *picture* T-166

called marsh tortoise T-116

Muenster cheese C-165

Muezzin (*mü-êz'in*), crier who calls Mohammedans to prayer, *picture* M-214

Mufti, Mohammedan official who interprets the law of the Koran and of tradition; also, term for civilian dress. *See also* Grand Mufti

Mugad'zhar Mountains, in Asia, range of Ural Mts. extending from Ural River s. almost to Lake Aral; 27,786 ft. highest peak.

Mugho pine, evergreen shrub (*Pinus mugho mughus*) of pine family, native to cent. Europe; a variety of the Swiss mountain pine. Common ornamental shrub in North America. Leaves in twos, to 2 in. long, dark green; cones oval, small. Low-growing with irregular flat crown.

Mugwort. *See in Index* Wormwood

Mugwumps, in U. S. politics, members of one party, who vote with another party (from Indian word meaning "big chief")

election of 1884 B-155

Mühlberg (*mül'bêrk*), Germany, town on Elbe River 35 mi. n.w. of Dresden; Emperor Charles V defeated Protestants under Elector of Saxony (1547).

Muhlenberg (*mq'lên-bêrf*), Frederick Augustus Conrad (1750-1801), American Lutheran clergyman, born New Providence (now Trappe), Pa.; member of Continental Congress and House of Representatives (speaker first and third Congresses).

Muhlenberg, Henry Melchior (1711-87), American clergyman, born Germany; emigrated to Philadelphia 1742 and organized first Lutheran synod in America 1748; real founder of American Lutheran church; father of John P. G. and Frederick A. C.

Muhlenberg, John Peter Gabriel (1746-1807), "fighting parson" of the American Revolution, born Trappe, Pa.; fought at Brandywine, Germantown, Yorktown, and brevetted major-general; statue stands in Statuary Hall of the national Capitol.

Muhlenberg College, at Allentown, Pa.; Lutheran school for men; founded 1867; arts and science.

Muir (*mür*), Alexander (1830-1906), Canadian song writer, born Scotland; public school teacher; in 1867 wrote Canadian national anthem, 'The Maple Leaf Forever'.

Muir, John (1838-1914), American naturalist and explorer M-297

quoted N-22c, Y-207

Muir Glacier, large and picturesque ice sheet of s.e. Alaska, in Glacier Bay National Monument; about 350 sq. mi.; discovered by John Muir: A-101

Muir Woods, Calif., national monument N-22c

Mukal'la, Makalla, or Mokalla, important seaport in Hadhramaut, Arabia, pop. about 18,000: *map* A-242

Mukden (*myk-dên'*), Manchukuo, also Fengtienfu, chief city and former capital, on Hun River; pop. 775,000; cap. of Manchu emperors in 17th century: *maps* M-49a, A-332b

battle of R-198

mineral deposits near M-51

Mukerji (*mük'êr-jê*), Dhan Gopal (1890-1936), Hindu (Brahmin) author, born Calcutta, India; profound interpreter of oriental civilization (for young people: 'Hari, the Jungle Lad'; 'Gay Neck', awarded Newbery medal 1928; 'Ghond the Hunter'; 'Rama, the Hero of India'; 'Chief of the Herd'; for adults: 'Caste and Outcast'; 'My Brother's Face'; 'Son of Mother India Answers').

Mulat'to, a person having one white, one Negro parent.

Mulberry, any of several trees with black, white, or red fruit M-297-8, *picture* M-297, S-144

bark makes tapa cloth M-298, *picture* C-275

China C-221a

Japan J-188c

pest control I-90

United States S-145, M-297-8

Mulberry family, or Moraceae (*mô-râ'-sê-ê*), a family of plants, shrubs, and trees including the osage orange, the mulberries, banyan, fig, bo-tree, upas-tree, breadfruit, jackfruit, breadnut, hemp, Mexican rubber-tree, snakewood tree, fustic, and the hop.

Mulch, material such as manure, leaves, pulverized earth, placed on surface of soil to retain moisture and to protect plant roots from frost

principle of capillarity C-81

winter protection for plants G-12

Mul'de River, Germany, rises in Erzgebirge and flows n. 150 mi. to Elbe at Dessau.

Mule, a hybrid animal H-345, *picture* H-344

Spain, *picture* S-226

"Mule," a kind of spinning machine C-400, I-74c, *picture* W-143

Mule deer D-37, *picture* D-36

Mule killer, or rear horse, a mantis M-55

Muleys, hornless cattle C-106

Mulhacen (*mq'l-ü-thân'*), highest summit in Spain, 11,420 ft.; in Sierra Nevada, s.e. of Granada.

Mulhall, Sara Graham, American reformer, born England; leader of war against drugs; worked to secure passage of federal law forbidding importation of opium.

Mülheim (*mül'him*) on the Ruhr, Germany, coal and iron mining and manufacturing town in Rhine Province of Prussia; pop. 128,000; 4 mi. n. of Düsseldorf.

Mulholland, John (born 1898), magician, writer; born Chicago; taught industrial arts, Horace Mann School for Boys, New York City; editor *The Sphinx*, magazine for magicians ('Magic in the Making'; 'Quicker than the Eye'; 'Story of Magic'): *pictures* M-32a, b, d

Mulhouse (*mül-pz'*) (German Mülhausen, *mül'hau-sên*), commercial center in Upper Alsace, France; pop. 97,000; large textile manufactures; under German rule 1871-1918; again occupied by Germany 1940: *map* G-66

Mull, island off w. coast of Scotland, 2d largest of Inner Hebrides; 367 sq. mi.; chief town Tobermory: H-267

Mull, a thin fabric of cotton or cotton and silk mixture, soft or stiff in finish.

Mul'lah, complimentary title given to Mohammedan priest.

Mullein (*mül'ên*), tall, woolly biennial herb (*Verbascum thapsus*) of the figwort family, with stout stem, large oblong leaves, and yellow flowers densely arranged on a long cylindrical spike.

Mullein pink, dusty miller, or rose campion, biennial (*Lychnis coronaria*) of the pink family with oblong, hairy leaves and loose clusters of showy rose-colored flowers

how to plant G-11

Müller, Franz Joseph (1740-1825), Austrian chemist, discoverer of tellurium (1782).

Müller (*mül'êr*), (Friedrich) Max (1823-1900), Anglo-German Orientalist, Sanskrit scholar, and popularizer of comparative philology, born Germany; removed to England 1846; taught at Oxford University about 20 years ('Chips from a German Workshop'; 'History of

ü=French u, German ü; gem, jō; thin, then; ù=French nasal (Jeañ); zh=French j (z in azure); k=German guttural ch



- Ancient Sanskrit Literature'; edited 'The Sacred Books of the East').
- Müller, George Elias (1850-1934), German psychologist, known for work on memory and color perception; claimed a piece is memorized more quickly by reading whole than by learning bits.
- Müller, Johannes (1801-58), German physiologist, early student of comparative anatomy and nerves of animals; showed dependency of physiology on other sciences.
- Müller, Maud, heroine of Whittier's poem 'Maud Muller'.
- Mullet, name of a variety of valuable edible fishes, principally of family *Mugilidae* (the gray mullets); nearly cylindrical bodies; found in most parts of temperate and tropical zones; not to be confounded with the red mullet of the Romans which is a surmullet or goatfish related to the drums and croakers.
- Mullica River, in s.e. New Jersey, map N-90
- Mullins, or Mullines, Priscilla, one of Mayflower Pilgrims M-92
- Miles Standish and S-270
- Mullion, in architecture, the vertical bar which divides the panes of a window or the panels of a door; also called munnion, or muntin.
- Mull of Galloway, promontory with lighthouse, s. end Scotland.
- Mulock (*mū'lok*), Dinah Maria. See in *Index* Craik, Dinah Maria
- Mulock, Sir William (born 1844), Canadian statesman; postmaster-general, 1896-1905; first minister of labor, 1900-05; chief justice of Ontario; chancellor University of Toronto; largely responsible for adoption of penny postage within British Empire.
- Mulready, William (1786-1863), Irish artist and illustrator S-268
- Multan (*mūl-tān'*), or Mooltan, in Punjab, India; railroad center, 190 mi. s.w. of Lahore; pop. 120,000; principal manufactures are silk and cotton, carpets, shoes, glazed pottery; large trade center; captured by British in 1849; map A-332c
- Multigraph, machine for multiple typewriting or printing, the type-written copies being produced by means of a metal "blanket" carrying strips on which the letters have been stamped revolving against an inked ribbon. For printed copies type is set in a revolving cylinder.
- Multiplane, airplane having more than two lifting surfaces, picture A-66
- Multiple, least common A-286-7
- Multiple arch dam D-65
- Multiple control, in street railway cars S-307
- Multiple Proportions, Law of, in chemistry C-167a
- Multiplex telegraphy T-34
- cables use C-6
- Multiplicand' M-298
- decimal D-26
- Multiplication M-298-300
- algebra A-123
- calculating machines C-20
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- fractions F-167, 168, 169
- logarithms P-341
- mixed numbers F-169
- short cuts M-300
- Multiplier M-298
- decimal D-26
- Multnomah Falls, beautiful cascade in the Columbia River, 30 mi. e. of Portland, Ore., picture O-245
- Mulvaney (*mūl-vā'nī*), Terence, in 'Soldiers Three' and other tales by Kipling, a reckless resourceful Irish private in India.
- Mulvian Bridge. See Milvian
- Mumford, Lewis (born 1895), author, born Flushing, L.I., N.Y.; lectured on literature and architecture New School for Social Research, New York City, 1925 and at Dartmouth College 1931-35 ('Civilization in the United States'; 'Sticks and Stones'; 'The Culture of Cities'; 'Men Must Act'; 'Faith for Living').
- Mummers, or maskers C-228
- Mum'michog, a mudfish M-297
- Mummy M-301, picture E-208
- animals E-210
- case, picture E-336
- cotton wrappings, Peru C-380
- funeral ceremony, picture E-206
- Indians I-65
- religious belief concerning E-203
- Mumps, contagious disease characterized by inflammation and swelling of the parotid glands P-206
- Mumuku (*mū-mū'kyū*), violent trade-winds off Hawaiian Islands.
- Munch (*mūnk*), Edward (1863-1944), Norwegian painter; early works marked by gloomy subjects; these later gave way to realistic and vigorous landscapes and portraits.
- Munchausen (*mūn-chō'sēn*), Baron, the name given the pretended author of a book of tales and travels by Rudolph Eric Raspe (1737-94), a German scholar who had left his native Hanover for England. The real Baron Hieronymus Karl Friedrich von Münchhausen (*mūnk'hōu-sēn*) (1720-97) of Hanover had nothing to do with the book. In later editions other writers added "lies from all literature" to Raspe's original tales.
- München (*mūn'kēn*), Germany. See in *Index* Munich
- München-Gladbach, Germany, manufacturing center in Rhine province, w. Prussia, 15 mi. s.w. of Düsseldorf; pop. 130,000; textiles, leather, machinery, foundry products.
- Mun'cie, Ind., city 51 mi. n.e. of Indianapolis on White River, in agricultural and natural gas region; pop. 49,720; automobile parts, glass jars, steel wire and cable; Ball Teachers College; map I-46
- Munda (*mūn'dū*), ancient town in s. Spain where Caesar defeated sons of Pompey (45 B.C.); location undetermined.
- Mun'delein, George William, Cardinal (1872-1939), Roman Catholic prelate, born New York City; archbishop of Chicago 1916-39; created cardinal 1924.
- Mundelein College, Chicago, Ill.; Roman Catholic institution for women, founded, 1930; arts and sciences; picture C-194
- Mongoose. See in *Index* Mongoose
- Munhall, Pa., borough on Monongahela River 7 mi. s.e. of Pittsburgh; pop. 13,900; iron and steel products.
- Muni, Paul (Muni Weisenfreund) (born 1895), American actor, born Lemberg, Austria; came to America 1899 with actor parents; 18 years with New York Yiddish Art Theater before Broadway debut in 'We Americans'; in motion pictures after 1932 ('Emile Zola'; 'Louis Pasteur'; 'Scarface'; 'The Good Earth').
- Munich (*mū'nīk*), Germany, also München, cap. of Bavaria; pop. 830,000; M-301-2, map G-66
- art galleries and museums M-301, table M-392, 393
- Hitler in H-311
- puppet theater P-368b
- Munich Pact of 1938 E-326b, C-421
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- borough system in New York City N-134
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- commission form M-302
- English, in Middle Ages D-46
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- fire department F-53-6
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- police P-287-90
- public utilities P-364; Cincinnati railway C-236
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- Municipal improvement C-241-2. See also in *Index* City planning
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- Edmonton, Alberta E-161
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- Glasgow public utilities G-100
- Jacksonville, Fla. J-180
- New Orleans belt railway N-100
- Regina, Saskatchewan R-70
- waterworks W-56
- Muninn (*mū'nīn*), in Norse mythology, picture O-203
- Munitions Control Board, National N-75b
- Munkácsy (*mūn'kū-chē*), Michael (1844-1900), Hungarian genre, religious, and historical painter, master of a dramatic style and of profound characterization ('Milton Dictating Paradise Lost'; 'Christ before Pilate', called by some critics the greatest religious painting of 19th century).
- Munn vs. Illinois, decision in U-212
- Muñoz, Aegidius. See in *Index* Clement VIII
- Munro, Hector Hugh (1870-1916) (pseudonym Saki), English short story writer and newspaper correspondent, born Burma; his cleverly written stories are replete with subtle irony, satire, wit, geniality, and understanding of human nature; killed in 1st World War ('The Westminster Alice'; 'Not So Stories'; 'Reginald'; 'Beasts and Super-Beasts').
- Munroe, Kirk (1850-1930), American author of books of adventure for boys; born Prairie du Chien, Wis.; while exploring for railroad routes in West became acquainted with Indian life, and knew Kit Carson and Buffalo Bill; later lived in Florida ('The Flamingo Feather'; 'Through Swamp and Glade'; 'The White Conquerors').
- Mun'see, tribe of North American Indians of the Delaware family; sometimes called Wolf because wolf was their totem; a remnant now scattered in United States and Canada.
- Munsell color system C-308d
- Munsey, Frank Andrew (1854-1925), American newspaper and magazine publisher; founded *Munsey's Magazine* and other popular periodicals;

Key—cāpe, āt, fār, fāst, whāt, fāll; mē, yēt, fērn, thēre; ice, bīt; rōw, wōn, fōr, nōt, dō; cūre, bīt, rȳde, fȳll, bārn:

- owned, among other newspapers, New York *Sun* and New York *Herald*; amassed a fortune, of which \$17,000,000 was left to Metropolitan Museum, New York City.
- Munson shorthand S-134-5
- Münster (*mün'stēr*), city in w. Germany, 80 mi. n.e. of Cologne; Dortmund-Ems Canal; pop. 106,000; textile and leather manufactures; university; Peace of Westphalia signed here 1648; map G-66
- Munster, largest of 4 provinces of Ireland, in s.w.; 9317 sq. mi.; pop. 942,000.
- Münsterberg, Hugo (1863-1916), German-American psychologist, born Danzig; professor of psychology and director of laboratories at Harvard after 1892 ('American Traits'; 'On the Witness Stand'; 'Psychology and Life').
- Munthe, Axel Martin Frederik (born 1857), Swedish doctor and author; lived in Paris and on Island of Capri, Italy; wrote in English; in British Red Cross during 1st World War ('Story of San Michele').
- Munt'jac, barking deer of India D-37
- Muntz metal, known also as yellow metal, variety of brass containing 60 per cent copper, 40 per cent zinc; resists corrosion; invented in 1832 by G. F. Muntz.
- Muonio River, Lapland, forms part of boundary between Finland and Sweden; flows into Tornio.
- Murad (*mū'rād*), or Amurath, I (1319-89), sultan of Ottoman Empire 1359-89; son of Orkhan; continued expansion of Ottoman rule in Europe; took Adrianople 1361; subjugated Asia Minor; killed in battle against the Serbians.
- Murad, or Amurath, II (1403-51), sultan of Ottoman Empire 1421-51; son of Mohammed I; fought against the Hungarians under their leader Hunyady; defeated them at Varna 1444 and again at Kosovo 1448: T-162
- Murad, or Amurath, III (1545-95), sultan of Ottoman Empire 1574-95; son of Selim II; rule marked by gains of territory in Persia and losses in Hungary.
- Murad, or Amurath, IV (1611-40), sultan of Ottoman Empire 1623-40; recaptured Baghdad from the Persians 1638; known for his tyranny and cruelty.
- Muradabad, India. See in Index Moradabad
- Mural painting, or wall painting P-15
- Abbey: Penn's treaty with Indians', picture H-226; 'Quest of Holy Grail', pictures A-315, 316
- Alexander: 'Labor', picture U-250
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- Cox, Kenyon C-387
- Egypt E-204, 209, picture P-14
- Elliott: 'Diana of the Tides', picture A-311
- Giotto G-89-90: 'Twelve Apostles', picture P-15
- Guido Reni: 'Aurora', picture A-365
- Hewlett: 'Brooklyn Bridge', picture A-312
- Holslag: 'Pony Express', St. Joseph, Mo., picture C-324b
- Leonardo da Vinci V-300: 'The Last Supper', picture V-299
- Mexico M-142b, pictures M-142f, L-67k
- Michelangelo M-146-8, S-139: 'Creation of Adam', picture M-147
- Raphael R-50
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- Sargent S-29: 'Frieze of the Prophets', picture P-353
- Turner: 'Burning the Peggy Stewart', picture R-86
- Murasaki Shikibu (*mū'rā-sū-kē shē-kē-bō*), 11th-century Japanese author; her 'Tale of Genji' has been translated into English: J-191
- Murat (*mū-rā'*), Joachim (1767-1815), French Revolutionary cavalry leader, and marshal of the empire; husband of Napoleon's youngest sister Caroline; king of Naples 1808; in 1815, hoping to make himself king of all Italy, declared war on Austria but was defeated; the restored King Ferdinand had him courtmartialled and shot.
- Muratore (*mū-rā-tōr'*), Lucien (born 1878), French operatic tenor, born Marseilles; sang with New York, Chicago, and European opera companies; married Lina Cavalieri.
- Murch'ison River, stream in western Australia, flowing s.w. into Indian ocean, map A-372a
- Murcia (*mū'rthē-yā*), Spain, industrial center, cap. of province of same name in s.e., on river Segura; pop. 160,000; silk industry: map S-226
- Murder, punishment for P-349
- "Murder will out," origin C-136
- Murdock, William (1754-1839), Scottish engineer, inventor of coal-gas lighting G-22, picture G-23
- Mu'rex, genus of mollusks that secrete Tyrian purple, picture S-107
- Mur'free, Mary Noailles (1850-1922), American novelist, born Murfreesboro, Tenn.; early work published under pen name of "Charles Egbert Craddock" ('The Prophet of the Great Smoky Mountains' and other stories of Tennessee life).
- Murfreesboro, Tenn., city 33 mi. s.e. of Nashville; pop. 9495; cap. of state 1819-26; cotton trade; red cedar market; state teachers college: maps T-46, C-253
- battle of F-193: Thomas at T-82
- Murger (*mür-zhēr*), Henri (1822-61), French novelist and poet; described life of young students, writers, and artists in Paris; Puccini's opera 'La Bohème' based upon his sketches 'Scènes de la vie de Bohème'.
- Muriatic acid. See in Index Hydrochloric acid
- Murillo (*mū-rē'yō*), Bartolomé Esteban (1617-82), Spanish painter M-302-4
- paintings in Seville S-86
- Velasquez contrasted with V-274
- Mur'man coast, Russia, Arctic coast of Kola peninsula R-179
- Murmansk (*mūr-mānsk'*), Russia, port and naval station on Arctic Ocean; ice-free year round; center for fishing and mining industry; connected by railroad to Leningrad; pop. 115,000: R-179, map E-326e
- Murphy, Charles Francis (1858-1924), American politician, Croker's successor as leader of Tammany.
- Murphy, Edgar J. (born 1901), American physicist, born Luthersville, Ga.; with F. Allison, co-discoverer of virginium (1930) and alabamine (1931).
- Murphy, Frank (born 1893), jurist and politician, born Harbor Beach, Mich.; mayor of Detroit 1930-33; U.S. high commissioner to Philippines 1935-36; governor of Michigan 1936-39; attorney general of U.S. 1939; associate justice U.S. Supreme Court 1940; took leave of absence, enlisted in Army 1942.
- Murphy, Isaac (1802-82), Civil War governor of Arkansas A-299
- Murphy, William Parry (born 1892), medical scientist, born Stoughton, Wis.; director Peter Bent Brigham Hospital, Boston, and teacher at Harvard Medical School; shared, with George R. Minot and George H. Whipple, Nobel prize (1934) for discovery of value of raw liver or liver extract in treatment of anemia.
- Murphysboro, Ill., industrial city on Big Muddy River, 140 mi. s. of Springfield; pop. 8976; in agricultural, coal and shale region and fruit belt; flour, shoes, wood products.
- Murray, (George) Gilbert (Aimé) (born 1866), British classical scholar, best known for translations of plays of Euripides in English verse ('History of Ancient Greek Literature'; 'Rise of the Greek Epic'; 'Four Stages of Greek Religion').
- Murray, James (1721-94), British soldier and statesman, born Ballencrief, Scotland; one of Wolfe's brigadiers in siege of Quebec in 1759; 1760 appointed military governor of Quebec; first civil governor of Quebec province 1764-68; opposed British government's repressive measures against French Canadians.
- Murray, Sir James Augustus Henry (1837-1915), British lexicographer, born Denholm, Scotland; twice president of Philological Society of London, in connection with which he became editor, 1879, of the 'New English Dictionary' (Oxford Dictionary), called most exhaustive work of its kind in any language.
- Murray, or Moray, James Stuart, Earl of (1531?-70), half brother of Mary, Queen of Scots and her protector and chief adviser on her return from France; her chief enemy after her open break with Protestantism, and regent for the infant James after Mary's abdication.
- Murray, Sir John (1841-1914), British oceanographer, born Cobourg, Ontario; edited reports of the *Challenger* expedition, and wrote numerous books and papers on scientific subjects.
- Murray, Lindley (1745-1826), American grammarian, born Swatara, Pa. ('Grammar of the English Language', recognized standard in England and America for 50 years).
- Murray, Mary Lindley, heroine in Revolutionary War who in 1776 cleverly delayed British General Howe at her Manhattan mansion, thus saving large company of American army.
- Murray, Philip (born 1886), American labor leader, born Blantyre, Scotland; emigrated to U.S. 1902; coal miner in Pennsylvania; international vice-president United Mine Workers of America 1920-40; member National Industrial Recovery Board 1935; elected president Congress of Industrial Organizations 1940.
- Murray Bay, also La Malbaie, Canada, town on bay of the Murray estuary, about 90 mi. n.e. of Quebec; pop. 2408; favorite summer resort.
- Murray River, chief river of Australia draining, with Darling tributary, entire s.e. quarter; mouth on s. coast 40 mi. e. of Adelaide: A-375, maps A-372a, b
- Murre (*mūr*), a guillemot, bird of the auk family A-365
- nest and egg, picture B-127
- Murrumbidgee (*mūr-ūm-bij'ē*) River, in s.e. Australia; flows through New South Wales 1350 mi. into

ü=French u, German ü; gem, gō; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); k=German guttural ch

# Fact-Index

## THE GREAT MUSEUMS OF THE WORLD ART GALLERIES AND ARCHEOLOGICAL COLLECTIONS

### United States

PLACE	NAME	ESTABLISHED	CONTROL OR MAJOR SUPPORT	OUTSTANDING CHARACTERISTICS OF COLLECTION
Boston	Museum of Fine Arts	1870	Endowment	Painting, sculpture, decorative arts. Oriental art collection.
Cambridge	William Hayes Fogg Art Museum	1895	Harvard Univ.	Painting, sculpture, prints, ancient and oriental art.
Chicago	Art Institute	1879	Endowment	Painting, sculpture, architecture, prints. Art school.
	Oriental Institute Museum	1894	Univ. of Chicago	Oriental archeology. Graduate school in ancient oriental history and archeology.
Cincinnati	Art Museum	1881	Memberships	Painting. Art school.
Cleveland	Museum of Art	1913	Memberships	Educational work. Medieval art.
Detroit	Institute of Arts	1885	Memberships	Educational work. Paintings.
Minneapolis	Institute of Arts	1911	Memberships	Sculpture, painting, and decorative arts.
New York City	Hispanic Society of America	1904	Endowment	Most notable Hispanic collection in U. S. A.
	Metropolitan Museum of Art	1870	Endowment	Best general collection in U. S. A.
	Museum of Modern Art	1929	Endowment	Modern art, mainly American and French.
Philadelphia	Pennsylvania Museum of Art	1876	Memberships	Paintings. Decorative arts. American colonial art. School of Industrial Arts. Rodin Museum, a branch.
	University Museum	1889	Univ. of Penn.	Egyptian and Babylonian archeology.
Pittsburgh	Carnegie Institute Department of Fine Arts	1896	Endowment	Sculpture, painting, prints. Annual international exhibitions.
Saint Louis	City Art Museum	1879	Memberships	General collection.
Santa Fe	Museum of New Mexico	1909	Archeol. Inst. of America	Special attention to native American art. Archeology of America.
Toledo	Museum of Art	1901	Memberships	Finest display of ancient glass in the world.
Washington, D.C.	Corcoran Gallery of Art	1869	Endowment	American art. Free art class.
	Freer Art Gallery (Smithsonian Institution)	1906	Nation	Whistler, Dewing, Thayer, and Tryon collections. Strong in oriental art.
	National Collection of Fine Arts, Smithsonian Institution (known as National Gallery of Art 1906-37)	1937	Nation	Paintings, engravings, decorative arts.
	National Gallery of Art (Smithsonian Institution)	1937	Nation	Sculpture and painting. Andrew H. Mellon, Samuel H. Kress, and Joseph E. Widener collections.

### Foreign

Amsterdam	Rijksmuseum (State Museum)	1877	State	Especially strong in Dutch painting. Rembrandt's 'Night Watch'.
Antwerp	Royal Museum of Fine Arts	1890	State	Rubens and early Flemish school.
Athens	National Museum	1866	State	Sculpture, bronzes, vases, figurines, Mycenaean and Egyptian antiquities.
Berlin	State Museum	1830	State	Includes Kaiser Frederick Museum. Antiquities from Pergamum.
	National Gallery	1876	State	Paintings, old masters and new masters.
Brussels	Royal Museum of Fine Arts	....	State	In two buildings. Works of early Flemish painters.
Buenos Aires	National Museum of Fine Arts	1895	State	Modern French, Spanish, and Italian painting and sculpture.
Cairo	Museum of Egyptian Antiquities	1858	State	Rich in material from excavations in Egypt.
Dresden	Royal Picture Gallery (Zwinger)	1707	State	Dutch, Flemish, Italian paintings. Raphael's 'Sistine Madonna'.
Florence	Pitti Palace	....	State	Raphael, Titian, and Andrea del Sarto. 'Primitives. Drawings.
	Uffizi Gallery	....	State	Raphael's 'Madonna del Cardellino'.
Hague	Hague Gallery (Mauritshuis)	1821	State	Dutch and Flemish masters. Rembrandt's 'Anatomy Lesson'.
Leningrad	Hermitage	1852-1917	State	Most of the other famous collections of Leningrad have been added to this collection.
London	British Museum (Department of Antiquities)	....	State	Archeology of Greece and Egypt. Elgin marbles.
	National Gallery of British Art	1824	State	Best Italian collection outside of Italy. Best English collection.
	Tate Gallery (part of National Gallery)	1899	State	19th-century and modern paintings.
Madrid	Prado National Museum	....	State	Next best collection in world after Louvre. Velasquez.
Montreal, Quebec	Antiquarian and Numismatic Society of Montreal	1862	State	Local history.
Munich	Ältere (Old) Pinakothek	1825	State	Rubens, Dürer. Raphael's 'Madonna of the Tempio Palace'.
Naples	National Museum	1738	State	Van Eyck's 'Jerome', Raphael's 'Madonna del Divino Amore'. Sculpture.
Nuremberg	German National Museum	1852	State	Medieval Germanic art and culture.
Paris	Cluny Museum	1844	State	Objects of art of middle ages, household furniture, clothes, etc.
	Louvre	1793	State	Finest collection in world. Painting, sculpture, prints, tapestries.
	Luxembourg	1750	State	Modern sculpture and painting.
Rome	Borghese Palace	1901	State	Collection of Borghese family. Titian's 'Sacred and Profane Love'.
	Capitoline Museum	15th Century	City	Sculpture of ancient Greece and Rome.
	Conservatori Museum	....	City	Sculpture and painting. Bronze, 'Boy with a Thorn'.
	National Museum	1882	State	Sculpture of ancient Rome, vases, glass.
Santiago, Chile	National Museum of Fine Arts	....	State	Paintings and sculpture by Chilean artists and world masters.
Vatican City	Vatican Palace	....	Holy See	Sculpture, painting, tapestries. Raphael's 'Transfiguration'.
Venice	Gallery of the Academy	1879	State	Paintings of the Venetian school.
Vienna	Academy of Fine Arts (Kunsthistorisches Museum)	1891	State	Belvedere Gallery. Oriental and Egyptian archeology.

Key—cápe, át, fār, fást, whát, fáll; mē, yēt, fērn, thēre; íce, bīt; rōw, wón, fōr, nōt, dā; cūre, bŭt, rŭde, fŭll, bŭr



## THE GREAT MUSEUMS OF THE WORLD—Continued

## MUSEUMS OF SCIENCE AND INDUSTRY

## United States

PLACE	NAME	ESTABLISHED	CONTROL OR MAJOR SUPPORT	OUTSTANDING CHARACTERISTICS OF COLLECTION
Albany	New York State Museum	1843	State	Geology, flora and fauna of the State.
Berkeley, Calif.	Museum of Paleontology	1921	Univ. of Calif.	Paleontology of North America; rich remains found in pitch lakes.
Cambridge	Museum of Comparative Zoölogy (University Museum)	1859	Harvard Univ.	Natural history. Agassiz collections.
	Peabody Museum of American Archeology and Ethnology (University Museum)	1866	Harvard Univ.	Ethnology of North and South America, Africa, Asia, and Pacific Islands.
Chicago	Chicago Natural History Museum	1893	Endowment	Zoölogy, botany, ethnology, meteorites.
	Museum of Science and Industry (Julius Rosenwald)	1926	Endowment	Science, and its application to industry.
Dearborn, Mich.	Edison Institute of Technology	1929	Endowment	American life and industry. Greenfield Village.
New York City	American Museum of Natural History	1869	Endowment	Anthropology and all other sciences except botany.
	Museum of the American Indian	1916	Heye Found.	Ethnology, archeology, physical anthropology of American aborigines.
Philadelphia	Commercial Museum	1894	Endowment	Commerce, industry, geography.
Washington, D.C.	National Museum (Smithsonian Institution)	1846	Nation	All branches of science, industry, communication and transportation.

## Foreign

Antwerp	Plantin-Moretus Museum	1876	City	Printing. Has tools used by Plantin.
Berlin	Natural History Museum	.....	.....	Natural history.
Budapest	Agricultural Museum	1896	State	Agriculture. Models of farms and homes, insect life, animals.
Leningrad	Russian State Museum	1895	State	Ethnography, art, history of civilization.
London	Science Museum	1853, 1908	State	General science. Has original materials and models of great inventions.
	British Museum (Natural Science)	....	State	Collections in natural history.
	Victoria and Albert Museum	1872	State	History of art, as applied to crafts and trades.
Monaco	Oceanographic Museum	1899	Royal	Oceanography. Best on subject.
Montreal, Quebec	Peter Redpath Museum	1882	McGill Univ.	Natural sciences.
Munich	Deutsches Museum	1903	State (Bavaria)	Both science and technology. Planetarium.
Ottawa, Ontario	National Museum of Canada	1842	State	Natural sciences.
Paris	Museum of Arts and Crafts	1799	State	Industries of all kinds, industrial hygiene. Models of tools.
	Museum of Natural History	....	State	In Jardin des Plantes.
	Ethnographic Museum	1879	State	In the Trocadero. Part of Museum of Natural History.
Toronto, Ontario	Royal Ontario Museum	1912	State	Natural sciences and archeology.
Vienna	Natural History Museum	1889	State	Mineralogy, paleontology, zoölogy, anthropology, botany.
	Industrial Museum	1908	State	Industry in all its phases.

Murray River; navigable between June and November for boats of light draft as far inland as Hay.

Murry, J(ohn) Middleton (born 1889), English editor and critic; husband of Katherine Mansfield; literary reviewer *London Times*; editor *Athenaeum*, *Adelphi* ('Countries of the Mind'; 'Life of Jesus'; 'The Price of Leadership').

Muruts (*mū'ruts*), a tribe of natives of Borneo, known as able farmers. Murviedro, Spain. See in Index Sargentum

Murzuk (*mūr-zōk'*), or Murzuch, a caravan station in Libya; chief city of Fezzan: map A-42a

Mus (*mūs*), Publius. See in Index Decius Mus

Mus, the mouse and rat genus of rodents R-52, M-293

Musa (*mū'zā*), the banana genus of plants B-36-8

Manila hemp H-272

Musaeus (*mū-sē'ūs*) (5th century B.C.), Greek grammarian and poet story of Hero and Leander H-287

Mus'ca, insect genus including common flies.

Muscadine (*mūs'kā-dīn*) grapes G-136

Mus'carine, a poison found in certain mushrooms M-307

Muscat', also Masqat, seaport and cap. of independent state of Oman in e. Arabia; pop. 13,000 with Matrah; chief export, dates; name sometimes given to Oman itself: A-238, maps A-242, A-332c, picture A-237 formerly controlled Zanzibar Z-215

Mus'cat, or mus'catel, one of several varieties of musk-flavored grapes, usually light colored; produces largest-sized raisins.

Muscatine', Iowa, industrial and trade center on Mississippi River 25 mi. s.w. of Davenport; pop. 18,286; known for watermelons and sweet potatoes grown on Muscatine Island near by; center of American fresh-water pearl button industry; sash and doors, canning and preserving: map I-120

Musci (*mūs'i*), the true mosses, one of the two classes of the phylum of plants, *Bryophyta*.

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voluntary and involuntary M-304-5

Muscle sense, or kinesthetic sense T-117

Muscle Shoals, Ala., town on Tennessee River; pop. 1113; site of nitrate and munitions plants developed by government after passage of National Defense Act of 1916 included in Franklin D. Roosevelt's

Tennessee Valley project T-49  
Wilson Dam W-51, A-98d, picture W-49

Mus'covite, mica M-145, M-184

Mus'covy, former name for Russia R-178

Muscovy Company, English company formed for trade with Russia and for polar exploration

Hudson's voyages for H-348, P-280

Mu'ses, in Greek mythology, goddesses presiding over the arts and sciences M-305, picture A-228

Museum (*mū-zē'ūm*), a collection of articles of various kinds, arranged and classified for exhibition; also the building in which the collections are kept. The word "museum" in its Greek form meant a temple sacred to the Muses. For a list of some of the important museums of the world, see accompanying tables on pages 392 and 393

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fossil preparation T-19, picture A-210

ü=French u, German ü; gem, go; thin, then; ñ=French nasal (Jean); zh=French j (z in azure); Ꝛ=German guttural ch

# Fact-Index

## A LIST OF MUSICAL TERMS AND FORMS

**A capella.** Unaccompanied singing by several voices in the manner of church music.

**Accelerando.** Increase the speed.

**Accent.** The emphasis on certain notes or chords required by the rhythmic pattern of a composition. "Artificial" accent, indicated by a special sign, demands stress of certain notes or chords.

**Accidental.** A sharp, flat, double sharp, double flat, or natural, usually signifying a departure from the key signature.

**Adagio.** Slow; 100-120 metronome beats to the minute. Also, a slow movement in a composition.

**Ad libitum.** At the pleasure of the performer.

**After note.** An unaccented note following an accented one.

**Allegro.** Quick, lively; 160-184 metronome beats to the minute.

**Andante.** Smooth, flowing, and rather slow in tempo; 126-152 metronome beats to the minute.

**Animoso.** In a lively, spirited manner.

**Answer.** Repetition of a motif or theme by voices or instruments other than the one which introduced it.

**Anticipation.** The introduction of a note before the sounding of the chord of which it is a part.

**Aria.** Literally an air, or melody; in opera, an important lyrical solo with instrumental accompaniment.

**Arpeggio.** A chord, the tones of which are played separately but in quick and regular sequence, as on a harp.

**A tempo.** In strict conformity to the established time.

**Ballet.** The music for a dance performed by one or more persons, whose movements are descriptive of an idea or emotion.

**Bar.** A vertical line on the staff, used to separate measures; the music between two such lines.

**Barcarole.** A song of the Venetian gondoliers, or an imitation of such a song. It is usually in a smooth, swinging tempo, suggestive of the graceful motion of a small boat.

**Berceuse.** A lullaby.

**Cadence.** A succession of chords or notes bringing a composition to its conclusion.

**Cantabile.** Even and continuous like a song.

**Cantata.** A short composition for solo voices and chorus, usually setting forth a brief Biblical narrative.

**Canzonetta.** A simple, short song, bright and light in character.

**Chant.** A short form of church music in which words, often from the Canticles or the Psalms, are intoned usually without rhythm on two reciting notes, each followed by a cadence.

**Chord.** Two or more tones heard at the same time; its structure is governed by the rules of harmony.

**Chromatic.** Progressing by half tones.

**Concerto.** A composition usually for solo performer, accompanied by orchestra, corresponding in form to the sonata.

**Crescendo.** Increase gradually the power or loudness of tone.

**Degree.** The step between two consecutive notes in a scale.

**Diatonic.** Progressing according to the diatonic scale; that is, the standard major or minor scale of eight notes.

**Diminuendo.** Decrease gradually the power or loudness of tone.

**Dominant.** The fifth tone in a scale. Next in importance to the tonic.

**Entr'acte.** Music performed between the acts of a play or opera.

**Étude.** A study (musical composition) intended for training or testing the performer's technical skill. Études of great beauty were written by Chopin, Debussy, and Liszt.

**Finale.** The last number in an opera, usually sung by soloists and chorus; or the concluding part of any musical composition.

**Forse.** Loud; *fortissimo*, very loud; *fortississimo*, extremely loud.

**Gavotte.** A gay round dance originated in France and resembling the minuet.

**Grace note.** A short note introduced as an ornament and not an essential part of the melody.

**Intermezzo or Interlude.** A short piece played between the acts, stanzas, or movements of a longer work. It may be played separately.

**Interval.** The distance between any two notes.

**Key.** The pitch of all tones in a scale, the keynote of which gives the key its name, as major C is the keynote or first in the scale of the key of C major.

**Largo.** Slow, stately, 40-70 metronome beats to the minute. Opposite of staccato.

**Legato.** In a connected, flowing manner.

**Libretto.** The text of an opera or other musical composition.

**Major.** Literally greater; used of intervals which are greater by a half tone than minor or smaller intervals; used also of keys and of chords in which such intervals predominate.

**Mazurka.** A spirited Polish dance in 3-8 or 3-4 time.

**Measure.** The notes between two bars. The measure represents a unit of rhythm since each measure has but one principal accent.

**Melody.** A succession of notes forming a tune or air; the leading part in a harmonized composition.

**Meter.** The regular succession of accents which establishes the rhythm of a composition.

**Mezzo.** Literally, half, medium; often used with other words, as *mezzo forte*, moderately loud.

**Minor.** Literally, smaller; used of an interval which is a half tone smaller than the corresponding major interval, of chords containing such intervals, and of scales in which such intervals predominate.

**Minuet.** A musical form in triple time to accompany the small, light steps of a dignified dance, also known by the same name. Often part of a suite.

**Modulation.** A transition from one key to another by a succession of related chords.

**Motif.** A distinguishing musical phrase which usually recurs frequently in a composition.

**Natural.** A note especially marked in a composition to nullify a sharp or flat indicated in the key.

**Natural scale.** A scale without sharps or flats; C major or A minor.

**Nocturne.** A composition, generally for the piano, in a tranquil and dreamlike mood.

**Obligato.** An accompaniment which is essential to the composition; usually written for a single instrument which supplements the leading part taken by another instrument or voice.

**Octave.** An interval of eight diatonic degrees.

**Opus.** A work, or composition, or a group of compositions.

**Oratorio.** A composition similar to an opera but founded on a Biblical theme and usually given without action or scenery.

**Overture.** An introductory part to an opera or other musical work; a concert overture is an independent composition for band or orchestra.

**Phrase.** A short passage which is more or less complete in itself and expresses a musical idea or thought.

**Piano.** Soft in tone; *pianissimo*, very soft.

**Polka.** A gay Bohemian dance in 2-4 time.

**Prelude.** An introduction to prepare for succeeding parts of a composition; sometimes applied to independent pieces of a rather informal character.

**Presto.** Rapidly; 184-208 metronome beats to the minute.

**Recitative.** Musical recitation to set forth narrative portions, especially in the older oratorios and operas.

**Rhythm.** The quality of music produced by regularly recurring accents.

**Rondo.** Musical form in which one principal theme is repeated three or more times, alternating with two secondary themes.

**Scale.** A series of tones proceeding upward or downward according to rules of musical composition.

**Scherzo.** A tuneful, vivacious movement, often a part of a sonata, concerto, or symphony.

**Score.** A printed copy of all the vocal and instrumental parts in a composition, the tones to be sounded simultaneously being placed one above the other.

**Signatures.** Symbols indicating the key and the time in which the music is written; the time signature appears on the first staff, the key signature at the beginning of every staff.

**Sonata.** A musical composition of three or four individual movements, yet so related as to form a unified whole.

**Staccato.** In a detached, unconnected manner. Opposite of legato.

**Staff.** The five horizontal, parallel lines, and their enclosed four spaces. The notes are written on the lines (that is, with the line running through the center of the note), or in the spaces, or above or below the staff, with small, extra lines (known as ledger lines) being supplied as needed.

**Symphonic poem.** A condensed symphony, in one movement, usually suggestive of a particular subject.

**Symphony.** A musical composition for orchestra, corresponding in form to the sonata.

**Syncopation.** A change in the regular rhythmic pattern by stressing a note that falls on an unaccented beat.

**Tarantella.** A very fast and emotional Italian dance in 6-8 time.

**Tempo.** The rate of speed at which a composition is to be performed. From the slowest to the fastest tempo, some of the commonest terms are: *largo*, *grave*, *lento*, *adagio*, *andante*, *moderato*, *allegro*, *presto*, *prestissimo*.

**Theme.** A musical phrase developed with variations and embellishments throughout a composition.

**Tonic.** The first tone in any scale; the keynote.

**Triad.** A chord of three tones arranged according to the laws of harmony.

**Triplet.** A group of three notes played in the time ordinarily required for two notes of the same length.

**Virtuoso.** One highly skilled in the playing of an instrument.

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 Musk deer M-323, *picture* D-35  
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 Muskegon, Mich., shipping and manufacturing center on Muskegon Lake between Lake Michigan and Muskegon River, 32 mi. n.w. of Grand Rapids; pop. 47,697; airplane, automobile, and marine engines, billiard and pool tables, knit goods; oil wells and natural gas; all-year steamship service to important lake ports: *map* M-153  
 Muskegon Heights, Mich., industrial suburb of Muskegon; pop. 16,047.  
 Mus'kellunge, or maskinonge, a fish of the pike family P-218, F-74  
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 Muskhog, or peccary, a small wild hog of North and South America P-100, *picture* H-316  
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 Muskhogean (*mūs-kō-gē'an*), or Mus-

kogian Indians, one of most important speech stocks of North America, formerly occupying greater part of s.e. U. S.; included Creek, Choctaw, Chickasaw, Seminole, Natchez, and others: I-54  
 Muskin'gum College, at New Concord, Ohio; United Presbyterian; founded 1837; arts and science.  
 Muskingum River, in Ohio, formed by union of Walhonding and Tuscarawas rivers; flows 120 mi. into Ohio River: *map* O-210  
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 Muskogee (*mūs-kō-gē*), Okla., manufacturing city and distributing center in e. near Arkansas River; pop. 32,332; in agricultural and stock-raising region; oil and natural gas near by: *map* O-216  
 Musko'ka Lake region, in Ontario, Canada; includes Muskoka River, Muskoka and numerous other lakes: L-72  
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 Musk-plant, a musk-scented plant (*Mimulus moschatus*) of the figwort family, with spreading sticky stems, alternate leaves, pale yellow flowers splashed with brown; corolla similar to snapdragon; cultivated in gardens.  
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 Mussolini (*mūs-sō-lē'nē*), Benito (born 1883), founder of fascism and former dictator of Italy M-325, I-158-61, *pictures* I-159, D-67d  
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 Mustapha (*mūs'tā-fā*) IV (1779-1808), sultan of Turkey (1807-08); abolished reforms of Selim III; assassinated.  
 Mustapha Kemal (*mō'stā-fā kā-māl*),



former name of Kemal Atatürk. *See in Index* Kemal Atatürk

Mustard, plant having pungent seeds used as condiment and in medicine M-325, C-1, 2, 3

Mustard gas, in warfare G-25

Mustela vison (mūs-tē'lā vī-sūn), American mink M-186

Mustelidae (mūs-tē'lī-dē), the weasel family, a family of carnivorous mammals including weasels, badgers, skunks, otters, martens, minks, wolverines, polecats.

Mutation, in biology, an important and abrupt change in the inherited attributes of a plant or animal. Hugo de Vries, of Amsterdam, Netherlands, was first to develop mutation theory

caused by X-rays X-201

theory of evolution E-342-3

Mute swan S-333, pictures S-334, color plate B-130

Mutsuhito (mut-sū-hē'tō) (Meiji) (1852-1912), emperor of Japan J-190, 191a

birthday celebrated J-193

Mutton, flesh of sheep

best breed for S-106, picture S-105

packing-house operations M-96, 97

Mutton-fish, a snapper of the West Indies (*Lutjanus analis*); one of the staple fishes of the Havana market; also called pargo.

Mutual Broadcasting Company R-30

Mutual insurance companies I-95

Mutualism, a plant partnership L-122

Mutual savings banks B-40

Muybridge, Edward (or Eadweard) (1830-1904), English-American photographer; made early experiments with motion pictures; M-290

Muzaffar-ed-Din (mū-zūf'ēr ēd dēn) (1853-1907), shah of Persia after 1896; filled depleted treasury by loans; discontent forced grant of liberal constitution (1906).

Muzhik (mū-zhik'), name of Russian peasant R-181

in 1st World War, picture W-157

Muzio (mūt'sē-ō), Claudia (1892-1936), Italian soprano; distinguished interpretation of opera rôles in United States and abroad.

Muzzle-loading gun F-48, 50, picture F-49

Mvule, an African timber tree T-8

Mycale (mīk'ā-lē), mountain in ancient Ionia, Asia Minor, near which Greeks destroyed Persian fleet 479 B.C.

Mycelium, food-getting body of a fungus

mushroom M-308

rust R-199

Mycenae (mī-sē'nē), ancient Greek city in Argolis, 50 mi. n.e. of Sparta, destroyed 5th century B.C. by Argos early civilization A-26, map A-25 jewelry, picture G-27

Mycerinus, or Menkaura, king of Egypt, son of Khufu (Cheops) pyramid of P-371, pictures P-372, C-18

Mycetozoa (mī-sē-tō-zō'ā), the slime molds when classified as animals. *See also in Index* Myxomycetes

Mycology, the study of fungi. *See in Index* Fungi

Mycophyta, phylum of plants including all the fungi, Outline B-205

'My Days Have Been So Wondrous Free', song by Hopkinson M-316

Myers, Jerome (1867-1940), American artist, born Petersburg, Va.; works show imagination and keen observation; chiefly interested in painting the common people of New York's East Side.

'My Heart Ever Faithful', song by Bach M-311

Myology, science of the muscles. *See in Index* Muscle

Myopia, near-sightedness E-352

spectacles for S-240

Myosin, protein in muscle B-109

Myosotis, forget-me-not F-159

directions for planting, chart G-11

Myriagram, a unit in metric system (22.046 lbs.) M-130

Myriapoda, or myriapods, a class of many-legged arthropods including centipedes and millipedes; now often replaced by two classes, the Chilopoda (centipedes) and Diplopoda (millipedes).

Myricaceae (mī-rī-kā'sē-ē). *See in Index* Sweet gale family

Myriophyllum, a genus of aquatic plants of the water milfoil family; usually whorled leaves, divided into numberless parts; flowers minute; common species called parrot's feather; frequently used in freshwater aquariums.

Myrmidons, a warlike race of ancient Thessaly led by Achilles in the Trojan War; term now used of devoted and unquestioning followers.

Myrob'alan, prune-like fruit of a tree of India used in tanning.

Myron (mī'rōn) (5th century B.C.), Greek sculptor

'Discobolus' G-166, picture E-334

Myrrh (mēr), a fragrant gum resin obtained from a small tree (*Commiphora myrrha*) native to E. Africa and Arabia; used as incense and in perfumery and medicine.

Myrtle, an evergreen shrub or tree M-325-6

Myrtle, Oregon. *See in Index* California laurel

Myrtle burl, or myrtlewood, the wood of the California laurel. Hard, with plain grain and mottle mixed; shaded golden-brown and yellow-green. This unusual wood valued for fine woodwork and dishes. Sometimes has dark purple markings.

Myrtle family, or Myrtaceae (mūr-tā-sē-ē), a family of shrubs and trees, native chiefly to the tropics, including the bottlebrush, eucalyptus gum-myrtle, and allspice.

Myrtle warbler W-7, color plate B-140

Mysia (mīsh'i-ā), ancient district of n.w. Asia Minor inhabited by the Mysi: map G-154

Mysore (mī'sōr), native state in S. India; 29,326 sq. mi.; pop. 6,560,000; native cap. Mysore (pop. 110,000); originally a Hindu kingdom; in middle 18th century taken by Mohammedan, Hyder Ali; captured by British 1799; British administrative cap. Bangalore: I-32, maps I-31, A-332c

giant bull of Siva, picture I-35

gold mines G-111

Maharajah's palace, picture A-331

Mysteries, Eleusinian D-45

'Mystery of Edwin Drood', a novel by Charles Dickens D-67b

Mystery plays, medieval plays depicting stories from Bible M-197, D-93

Mysticism, term used in various ways but usually to denote the belief that man can attain through contemplation a union with the Infinite and thereby gain knowledge otherwise unattainable

Maeterlinck's mysticism M-24

Mystic River, outlet of Mystic Lakes, Mass.; enters Boston harbor by wide estuary

towns on B-202

Mythology M-326-30, Outline M-327-30. *See also in Index* Animal worship; Folk-lore; Magic; Nature worship

American Indian I-63-4; Aztecs, pictures A-409, 410

Babylonian B-9-10

bibliography M-330

Chinese C-221i

Egyptian E-209-10, Outline M-327

Greek and Roman M-326, 327, Outline M-327-9

Irish I-132

Norse and Teutonic S-36, 37-8, Outline M-329-30

Mytilene (mī-tī-lē'nē), Mitylene, or Mytilini, chief city and capital of Lesbos, Greece; pop. 28,000; important naval and colonizing power in early history of Greece; birthplace of Sappho and Theophrastus; modern city export point for island; name Mytilini now used for whole island: maps G-154, E-326e

Myt'l, in Maeterlinck's 'Blue Bird' M-24

Myxedema, disease characterized by swelling of face and hands; caused by lack of thyroid secretion G-99

Myxomycetes (mīks-ō-mī-sē'tēz), the slime molds classed as plants S-163

Myxophyceae (mīks-ō-fī'sē-ē), the class of blue-green algae B-205